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Agricultural Policies and Food Security in Eastern and Southern Africa

Proceedings of a Symposium Held at the Kenya Commercial Bank, Nairobi, Kenya, May 18 - 20, 1994

A. W. Mukhebi, C. Ackello-Ogutu, W. Nguyo, R. Hassan, and W. Oluoch-Kosura

The Department of Agricultural Economics / University of Nairobi
and
The Nairobi Cluster Socioeconomics Group

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AGRICULTURAL POLICIES AND FOOD SECURITY

IN EASTERN AND SOUTHERN AFRICA

Proceedings of a Symposium held at the Kenya Commercial Bank
Nairobi, Kenya, May 18 - 20, 1994

EDITED BY

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PREFACE

The major challenge facing the countries in eastern and southern Africa is the achievement of sustainable economic growth and improved quality of life for the rapidly growing population. Consequently, the policy goals in most of these countries revolve around five broad thematic areas, namely, achieving and maintaining food security, increased rural (farm and off-farm) employment and incomes, access to improved farm inputs, increased foreign exchange earnings and minimisation of environmental degradation. However, success in achieving these policy goals has generally been elusive, partly due to lack of an enabling economic and political environment and partly due to poor implementation of development programmes. Low levels of investment in scientific research, poor adoption of technologies in food production, high unemployment levels, narrow export base, heavy foreign debt burden, frequent droughts and civil strifes are persistent nagging woes of development in the region.

Capacity building, especially the capacity for research, policy analysis and interpretation is clearly a crucial area of concern in the eastern and southern Africa region. Government ministries and national agricultural research systems in the region desperately lack the analytical and research capacity to handle the complicated policy issues mentioned above. Moreover, trained manpower is often lost from these publicly supported institutions through brain drain and politically motivated appointments to positions of least professional relevance. Capability to handle policy issues effectively is further weakened by an apparent mistrust between policy makers and trained policy analysts, a factor which does not augur well for dialogue and consultation on matters of common interest. With a growing concern to get agriculture moving, agricultural policy issues are expected to take a centre stage in the economic development agendas of practically all countries in eastern and southern Africa.

Arising from the aforementioned policy issues and concerns in the region, the Department of Agricultural Economics of the University of Nairobi in conjunction with the Nairobi Cluster Socioeconomics Group based at the International Livestock Research Institute in Nairobi organised a symposium from 19th to 20th May 1994 the proceedings of which are published in this volume. The broad theme of the Symposium was ***"Agricultural Policies and Food Security in the Eastern Africa Region"***. Three sub-themes were identified, namely *Sustainability of Agricultural Production; Agricultural Development and Trade; and Agricultural Institutions, Policy, Food Security and Training*. These policy issues were discussed in five sessions while the sixth session was devoted to a discussion of the revival of the Eastern Africa Association of Agricultural Economists (EAAAE) which ceased to function in 1977 due to the political constraints among the member countries of the former East African Community. The countries represented at the Symposium were Sudan, Ethiopia, Kenya, Tanzania, Zimbabwe, Uganda, Malawi and Zambia.

The issues addressed at the Symposium are not only of current intellectual interest to Agricultural Economists in the region, but are also of practical relevance and value to policy makers, donor agencies and agricultural producers, the latter being the end-users and beneficiaries of technologies and policies, and direct users of the natural resource base.

These proceedings present illuminating papers covering the above thematic areas and also present a report on the Symposium's unanimous resolution to initiate a new association of

Agricultural Economists, the ***Eastern and Southern Africa Association of Agricultural Economists (ESAAAE)*** as a replacement of the EAAAE. The overwhelming interest in the Symposium and the association was a clear manifestation that the agricultural economists in the region are willing to sit together and debate policy issues amongst themselves and with other researchers and policy makers. With a critical mass of over 100 agricultural economists, holding MSc. degrees and above, it is our strong feeling that future activities of the newly formed association will have wide patronage and desirable impact on the region's agricultural development. The proceedings are but a start of what is hoped to be deliberate efforts to enhance research, networking and communication among Agricultural Economists in the region.

CHAIRMAN

Organising Committee

ACKNOWLEDGEMENT

The members of the organising committee of the symposium on Agricultural Policies and Food Security in the Eastern Africa Region held from 18 to 20 May 1994 in Nairobi wish to thank all organisations and individuals who helped in planning and successfully holding of the symposium. In particular, we wish to acknowledge with thanks the financial support provided by the International Development Research Centre (IDRC) to facilitate the compilation of the registry of Agricultural Economists in the region as well as to support part of the budget for the symposium. The Rockefeller Foundation sponsored the participation of some of those from outside Kenya as well as the symposium venue expenses for which we are very grateful. The African Economic Research Consortium (AERC) is gratefully acknowledged for having facilitated participation of more delegates from outside Kenya than could have been possible otherwise. The Department of Agricultural Economics, University of Nairobi, and the Nairobi Cluster Socioeconomics Group are both acknowledged for accepting to host the symposium.

The organising committee would like to single out several individuals for having given the committee the necessary support and encouragement at times when it appeared that the symposium would not materialise. These include Drs. Luis A. Navarro and Ronnie Vernooy of IDRC, Dr. John Lynam of the Rockefeller Foundation, Dr. J. Fine and Prof. B. Ndulu of AERC.

Thanks also go to the Hon. S. Nyachae, E.G.H, M.P, Minister for Agriculture, Livestock Development and Marketing for personally opening the symposium and giving it the importance it deserved. Similarly, we wish to express our thanks to Mr. E. P Pallangyo of the United Nations Economic Commission for Africa for accepting to come and give a keynote address.

The participants of the symposium who contributed the papers or who actively contributed to the discussions deserve thanks for making the symposium a success.

Many other individuals contributed in different ways to the symposium and we would like to thank them all. We would like to acknowledge particularly the logistical assistance provided by C. Gor, J.J Okello and Grace Mwauda of the Department of Agricultural Economics, Veronica of CIMMYT/ Nairobi and Agnes of Sundial Travel Agency. In preparation of the proceedings we would like to acknowledge the efforts of Justin Wangila of Policy Research Group Ltd. and Lucy Kirori of ILRI.

MEMBERS OF THE ORGANISING COMMITTEE

Prof C. Ackello-Ogutu***(Chairman)***	-	Agric. Econ. Department, University of Nairobi
Dr. A. W. Mukhebi***(Secretary)***	-	International Livestock Research Institute, Nairobi
Dr. W. Nguyo	-	Policy Analysis Matrix Project, Nairobi
Dr. R. Hassan	-	CIMMYT/KARI, Nairobi
Dr. W. Oluoch-Kosura	-	Agric. Econ. Department, University of Nairobi

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SESSION 1: OPENING SESSION

Chairman: A. W. Mukhebi

Rapporteur: R. Hassan

INTRODUCTORY REMARKS

C. Ackello-Ogutu[1]

The Minister for Agriculture, Livestock Development and Marketing, The Honourable Simeon Nyachae, Ladies and Gentlemen:

Let me take this opportunity, on behalf of the organising committee, to welcome you all to this Symposium on Agricultural Policies and Food Security in eastern and southern Africa.

Your hosts are the Department of Agricultural Economics, University of Nairobi and the Nairobi Cluster Socio-Economics Group. Whereas you may all be aware of the Department of Agricultural Economics which is now 25 years old, some of you may not be familiar with the Nairobi cluster Socio-Economics Group.

The Nairobi Cluster was established in 1981 to promote effective collaboration among institutions of scientific research based in and around Nairobi. The Socio-Economics group is a recent component of the cluster, and its coordinator is Dr. Adrian Mukhebi. When the idea of a symposium was first mooted about a year ago, many agricultural economists expressed overwhelming interest. The enthusiasm does not appear to have diminished. Despite several logistical and financial hitches and two postponements, I am glad to note that all the countries in the region (except where there is social disequilibrium) are well represented at this symposium.

We have participants from Sudan, Ethiopia, Uganda, Tanzania, Malawi, Zimbabwe, Zambia and of course several participants from Kenya. We are happy and particularly grateful to the Honourable Minister for sparing time to personally come to perform the official opening.

The last time there was such a large congregation of Agricultural Economists in Eastern Africa was in 1976 when the International Association of Agricultural Economists held its triennial conference in Nairobi. Those of you who regularly attend the International Association's conferences (one of which is going to be in Harare in August this year) are aware that participants from Eastern Africa hardly number more than 25.

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[1] Associate Professor/Chairman, Symposium Organizing Committee, Department of Agricultural Economics, University of Nairobi, P. O. Box 29053, Nairobi, Kenya.

I am sure that the region's limited participation at such conferences is not a reflection of inherent apathy among us or lack of appreciation of the important role played by international exposure. It is true that research funds are limited and hence publishable materials short and that some of us are overworked and underpaid. However, we have to squarely shoulder the blame for failing to establish, within the region, the necessary professional infrastructure that will facilitate effective exploitation of our expertise for national development.

The agricultural economists in the region have continued to grow from strength to strength numerically as you can verify by comparing the directory we just issued with that compiled by the GTZ in 1985. It is regrettable, however, that we continue to depend on *ad hoc* meetings such as this and on conferences and journals of marginally related disciplines for dissemination of our research findings. It is worthwhile to note that in the 1970's there was a vibrant Association of Agricultural Economists in Eastern Africa. The Association also had a reputable journal publication. But in December 1977 the association held what turned out to be its last meeting at Egerton College; that was 17 years ago.

The question I wish to put to you my dear colleagues is this: what purpose is served by meeting once every seventeen years? This symposium is to try and answer this (rather) simple question.

In the next two days, various speakers will touch on a number of important agricultural policy issues; and we shall bombard the Honourable Minister with numerous prescriptions in food security and why he should not persistently blame the weather for food shortage. But unless we meet him again next month and next year, all our efforts will be of no long term consequence. We must open communication channels (and keep them open), first, among us, and second, between us and policy makers.

One symposium in seventeen years will not answer all the questions about food security in eastern and southern Africa. I would like us to go through our deliberations freely and candidly. This is the opportunity for us to start knowing each other and setting a solid base for future collaboration. I urge the ministers of agriculture in the region to engage agricultural economists in their councils of economic advisors and in the planning and evaluation of agricultural programs. This will contribute positively to regional capacity building thus reversing the current pathological trend of depending on foreign experts.

Finally, I take this opportunity to thank all of you for choosing to participate in this symposium. I hope that the experience will be intellectually rewarding to you as well as the institutions you are affiliated to.

OPENING ADDRESS

Honourable Simeon Nyachae[2]

Mr. Chairman, Invited Guests, Participants, Ladies and Gentlemen:

First, it is a pleasure for me to have been invited to open this symposium covering an important aspect of development in this country in particular and the Africa region in general. Agriculture forms the backbone of Kenya's economy and indeed almost all the countries in Africa. All the Governments desire appropriate policies to promote growth in agriculture and subsequently to attain food security. Therefore your symposium theme "Agricultural Policies and Food Security in the eastern and southern Africa" is of particular interest to my Ministry, Kenya and the region as a whole.

Secondly, I wish on behalf of the Kenya Government to welcome to this country all participants from outside Kenya and hope that you will have fruitful exchange of ideas with your Kenyan colleagues during the symposium. I hope recommendations will emerge from the deliberations which will help in designing appropriate policies and operational strategies to enhance household, national and regional food security.

This Symposium is being held at a time when Africa is faced with a myriad of problems, including serious food shortages, unemployment, high rate of population growth, environmental degradation, increasing number of refugees, poor health for disadvantaged groups, national debt service burden and many more. These problems have influenced the World Bank and the International Monetary Fund to prescribe Structural Adjustment Policies (SAPs) to be implemented by the countries represented in this symposium. We need informed opinions about the desirability of these policies, their effects and how to implement them for the betterment of our people. If there are alternative cost-effective ways of achieving a higher quality of life for our people than the SAPs, the symposium should come up with such alternatives for consideration by our governments.

Kenya government has just updated the National Food Policy originally published in 1981. Since we live in an ever changing world, the food policy cannot be static. My Ministry looks forward to the contributions of professionals in your field to facilitate incorporating appropriate food policies in response to changing circumstances to meet the needs of our people. In addition to publishing your research results in a regional scientific journal (which I am told is to be revived) and which may not be easily understandable to the users of the results, efforts should be made to make the results usable by the potential beneficiaries. Therefore, I would like the line of communication between the researchers in your field and my Ministry to be kept clear and busy.

Recent trends indicate that food production has failed to keep pace with the total food demand. This necessitates arrangements for commercial imports or dependence on food aid. In cases where scarcity of foreign exchange cannot permit attainment of commercial imports,

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[2] Member of Parliament and Kenya's Minister for Agriculture, Livestock Development ad Marketing.

the countries become extremely vulnerable to food poverty and must depend on food aid. When individual cereal import trends are examined over the years, evidence shows that imports for the fine grains such as wheat and rice have risen relatively faster and this influences consumption patterns in favour of these grains whose agronomic requirements are probably more demanding than the traditional grains. This calls for policies which aim at enhanced domestic production if the resources available are best suited to the production of food. I am happy to learn that this symposium will address the issue of resource management in our region.

The resource base for agricultural production in Kenya and many other African countries is poor compared to the population to be supported and the rate of growth of the population. This calls for a faster rate of technological generation through adaptive research and eventual diffusion and adoption by farmers. However, we find that in most African countries, including Kenya, the rate of technology generation and adoption has remained relatively low. We need to identify reasons for this low rate of adoption of technologies already on shelf and determine how the situation can be improved. Similarly, if the technologies are not available, strategies which can generate and transfer viable technologies in the widely dispersed farms (both large scale and small scale) should be identified. In the Kenyan case, over 60 percent of the marketable surplus comes from smallholder farms and therefore this category of producers must be addressed when developing and transferring technologies. At the same time, since women are known to be the backbone of small-scale agricultural production, their education and subsequent involvement in modern sector activities will help in speeding the development of the agricultural sector.

Agriculture in Africa is mainly rainfed and is therefore quite susceptible to weather conditions. Drought has remained an important natural catastrophe affecting crop and livestock production in many areas. Attempts to develop irrigated systems of agriculture have been rendered difficult due to high investment costs. Are there suitable designs of small-scale irrigation systems which can be cost-effective to minimise the problems of drought? How can the professionals act in a multi-disciplinary way to avail such cost-effective systems to the farmers? These are some o f the issues which should be addressed urgently. Other natural phenomena affecting food supply and availability and needing attention are crop and animal diseases and pests. It is disheartening to learn that almost 30 percent of the food produced is subsequently destroyed by pests and therefore unavailable for consumption. What can the scientists and the policy makers do to reduce this unnecessary loss?

The human resources necessary to undertake research and train others in agricultural production has been slow to develop. Many countries in Africa have not reached the saturation point beyond which the trained agriculturists are retained to work in their specialised fields. My Ministry is committed to continued training of agriculturists to manage agricultural production in the country. Similarly, my Ministry recognises that the literacy rate in the rural population has remained low, making communication through leaflets difficult. Efforts towards increasing the literacy rates by the Kenya government imply a more efficient means of communicating agricultural messages to the farmers once viable technologies exist.

In some areas, there is a prevalence of communal ownership of land which normally interferes with the linkage between productive effort and reward. Kenya's policy of land registration and private land ownership is meant to improve productivity of land but the process has taken almost four decades to complete. We need to establish how this process can be speeded up and whether there are any useful changes to be made in land policy in order to make the scarce arable land in Kenya more productive than hitherto.

The infrastructure in most of the African countries has not been well developed. The agricultural support system becomes difficult to operate. Timely delivery of inputs such as credit, fertiliser and certified or improved seed cannot be realised in many cases thus lowering productivity. Transport and storage services are inadequate just as marketing arrangements for most of the agricultural commodities have been unsatisfactory. Even in cases where governments benefit from food aid, distributional problems render them unavailable to the needy. With the emergence of privatisation of production and distribution of agricultural inputs and commodities, the government will increasingly devote its energies to the development of infrastructure and provision of market information to help the private sector activities to thrive.

The governments in Eastern Africa should also explore possibilities for regional cooperation on research and trade to minimise expenditure which will be involved if each country has to be self-sufficient.

Finally, I wish to extend to this symposium all the wishes and success in your deliberations. I am looking forward to the concrete operational strategies emanating from the symposium for possible implementation to enhance our food security.

Once more, I wish our foreign delegates a happy and pleasant stay in Kenya for the duration of the symposium and encourage them to take time off afterwards to visit rural areas where agriculture is practiced.

Mr. Chairman, it is now my pleasant duty to declare this Symposium on Agricultural Policies and Food Security in eastern and southern Africa officially open.

Thank you.

KEYNOTE ADDRESS: FOOD AND AGRICULTURAL POLICY AND AFRICAN DEVELOPMENT

E.P. Pallangyo[3]

The problem of hunger can be broadly divided into two types, viz., (1) famines, and (2) endemic deprivation. Famines are transient but violent events - they come and go, decimating the population and causing extreme misery and widespread death. In contrast, endemic deprivation is a more persistent phenomenon, forcing people to live regularly and ceaselessly in a state of undernourishment, disease and weakness. While endemic deprivation is less fierce as a calamity, it is also more resilient and affects more people. If famines kill millions through starvation and epidemic diseases, endemic deprivation can affect hundreds of millions through debilitation and illness, increasing mortality rates and shortening people's lives.

(Amartya Sen, Public Action to Remedy Hunger, The Hunger Project, 1990.)

INTRODUCTION

The first four years of the 1990s indicate that African economies have grown by a mere 1.5 percent per annum - worse than during the "lost decade" of the 1980s when Africa's economic annual growth rate was on average 1.8 per cent during the period 1980-1990. This growth is barely half of the rate of growth of Africa's population and is well below the annual average growth target of 4 per cent set by the World Food Conference in 1974, and still worse than the 6 per cent set in the United Nations New Agenda for the Development of Africa in the 1990s. This trend of continuing decline in per capita income also continues to translate itself into a further slide into hunger and poverty. More than ever before, Africa needs serious and clear rethinking, and a demanding persistence and consistency in doing things for itself, jettisoning the temptation to rely on graphic images or pictures of misery and starvation to work on the emotions of donors to arouse their sympathy and pity, spurring them into action to provide alms. The region will be challenged even more to increasingly rely on the generation of its own resources for development purposes, instead of waiting for foreign aid. Outside assistance can help but it must be teamed up with African resolve. Even the ancient Romans had a saying about "grants and gifts". *"Timeo dona ferentes"* - I fear bearers of gifts.

The low aggregate regional growth performance was the consequence of poor performance of the rural and agricultural sector which made only modest recovery. There is no gainsaying the fact that at the root of the continuing economic underdevelopment of Africa, its stagnation and decline lies the poor performance of this sector which has always been the most important single activity in African economies, and the food sector in particular as the data would show where over 70 per cent of the total working population is engaged[4].

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[3] United Nations Economic Commission for Africa (UNECA), Addis Ababa

[4] The experience of the more developed LDCs during the last four decades shows that the countries which had rapid agricultural growth had also rapid industrial growth. Similar historical relationship between agricultural development and general economic in the

Agricultural production which during 1961-1970 increased at an annual average growth rate of 2.9 per cent dropped to a negative growth of 2.4 per cent in 1991/1992. In the face of population growth rate of over 3 per cent a year, per capita food production was a negative growth of 5.3 per cent per annum during the same period down from negative 0.1 per cent during 1981-90 period. Africa, which during 1960-1970 period, was a small net exporter of food, having achieved a food self-sufficiency ratio (SSR)[5] of 102, saw this ratio decline to 75 during the 1978-1982 period. Taking cereals production alone, the SSR for the countries of Eastern and Southern Africa ranges from 0 and 1.5 in Djibouti and Mauritius respectively to 30 and about 37 in Comoros and Botswana; and 54, 58, 66, 76 and 77 in Lesotho, Mozambique, Namibia, Somalia and Ethiopia during the period 1988/90. See also Annex Table 3.

Table 1. Africa Indexes of Total and Per Caput Agricultural and Food Production

	Average Annual Growth Rate (Exponential)			
	1961-1970	1971-1980	1981-1990	1991-1992
Total agricultural production	2.9	1.3	2.8	-2.4
Per caput agricultural production	0.2	-1.5	-0.2	-5.2
Total food production	2.8	1.5	2.9	-2.5
Per caput food production	0.2	-1.3	-0.1	-5.3

Source: FAO, Agrostat data 1993, Statistics Division, Rome, Italy.

In the early 1970s, the number of hungry and malnourished people in Africa was about 80 million. The current corresponding figure is believed to be in the range of 175-200 million and it is likely to jump to 300 million by the year 2010 (FAO Agriculture: Towards 2010) if the present trends continue.[6] The daily per caput food consumption in Africa south of the Sahara has never exceeded 2140 k cal/day since the 1960s. Now it is estimated to be 2100 k cal/day - about 85 per cent of internationally recommended requirement for a healthy and active

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industrial countries can be found. Increased agricultural productivity appears therefore to be an essential prelude to Africa's industrial growth.

5 $$SSR = \frac{Domestic\ Production}{Domestic\ Utilization} \times 100$$

6 And if the export or industrial crops continue, often with the aid of external assistance, to place claim on the best lands, a large share of already meagre agricultural investment, research efforts, the delivery system, etc. with unequal support given to staple food crops for domestic consumption. Historical records indicate that apart from hybrid maize research in Zimbabwe (1932-1949) and in Kenya (1955-1964), most research during the colonial period concentrated on export crops. This legacy continues after more than 30 years of independence. One ought to add that even research on maize in these countries was prompted by the fact that maize was of commercial interest to the settler groups.

life. Hunger and malnutrition are reflections mainly of poverty. For instance, in the developing countries only 10-15 per cent of hunger stems from emergencies; most hunger, 85-90 per cent - is born of poverty. About 47.6 per cent of people in Africa south of the Sahara were classified as being below the poverty line in 1985 and this figure is likely to shoot up to 49.7 per cent by the year 2000. The number of poor in the region grew at roughly the same rate as the population, about 3 per cent per year during the 1980s. The minimum economic growth rate needed to reduce the number of poor is about 4.7 per cent. If African agriculture can achieve a 5 per cent annual growth rate, the sector will be instrumental in improving food security and reducing poverty.

Table 2. Daily calorie intake per caput in some African countries (1986).

Countries	K cal/cap
Kenya	2,060
Rwanda	1,830
Uganda	2,342
Botswana	2,201
Tanzania	2,200
Zambia	2,046
Zimbabwe	2,132

Source: FAO/Netherlands Conference on Agriculture and the Environment, Regional Document No. 1 (1991).

While remarkable progress has been made in some developing countries in reducing chronic hunger and abject poverty, especially in East and South Asia, the situation has deteriorated in Africa.[7] Towards the end of the 1980s, 40 out of 68 low-income, food-deficit countries failed to provide enough food to meet average nutritional requirements. Twenty-nine of them were in Africa, their people perennially condemned to hunger by inadequate incomes. The plight of starving people in the Horn of Africa and Southern Africa is all too familiar, especially in Ethiopia, Somalia, Sudan, Angola and Mozambique. Inasmuch as food security is not just a supply issue, but also a function of income and purchasing power, the results of an assessment of the changes in per capita income during the same period were equally disquieting. According to the United Nations estimates, between 1981 and 1990, real GDP per person in Africa recorded a negative average annual growth of 1.3 per cent. The figures in Annex Table 5 serve to provide a basic indicator of the direction of the trends in the incidence of abject poverty in Africa where in 1991 the number of people in this category increased to 140 million, as compared with 120 million in 1985.

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[7] In sharp contrast with Africa, the incidence of abject poverty is likely to have been substantially reduced in East and South Asia. The achievements of China, and to some extent, India are very impressive. The two governments have succeeded in translating growth into poverty alleviation, thereby also reducing the number of hungry people. In China, a doubling of income in rural areas in the 1980s pulled millions of rural households out of abject poverty. In India, anti-poverty programmes provided income-earning opportunities.

China, India and Indonesia among others in that region, realised spectacular increases in per capita food production during the 1980s.

Table 3. GDP Per Capita for Selected Countries of Eastern and Southern African Subregion, 1985-1992 (In Current and Constant 1980 Prices)

Country		1985	1986	1987	1988	1989	1990	1991	1992
Angola	Current	636	562	693	710	769	777	809	811
	Constant	454	497	545	599	590	591	601	601
	Growth (%)	0.95	9.44	9.63	9.86	-1.46	0.19	1.61	0.06
Botswana	Current	927	940	1112	1211	2163	2290	2567	3005
	Constant	1497	1551	1602	1747	1908	1933	2021	2031
	Growth(%)	2.93	3.58	3.35	9	9.25	1.31	4.53	0.52
Kenya	Current	341	383	394	381	363	376	330	322
	Constant	355	361	366	371	376	379	373	362
	Growth(%)	2.23	1.86	1.24	1.53	1.33	0.6	-1.4	-3.17
Lesotho	Current	163	176	227	271	288	314	334	397
	Constant	258	256	261	287	312	318	311	307
	Growth (%)	0.67	-0.92	2.19	9.71	8.67	1.95	-1.98	-1.32
Malawi	Current	155	170	150	162	188	191	241	205
	Constant	180	175	173	173	173	175	182	169
	Growth (%)	-1.34	-2.36	-1.3	-0.27	0.48	1.11	3.95	-7.27
Mozambique	Current	109	105	195	248	332	384	524	634
	Constant	89	88	90	93	95	95	95	91
	Growth (%)	-11.01	-1.29	2.95	2.92	2.7	-0.81	0.36	-4.03
Namibia	Current	838	935	847	1164	1106	1170	1242	1320
	Constant	1268	1264	1282	1312	1255	1282	1304	1260
	Growth (%)	2.25	-0.32	1.43	2.36	-4.38	2.21	1.71	-3.36
Swaziland	Current	498	530	617	638	791	817	901	1080
	Constant	1005	1008	1057	979	1007	1046	1034	1025
	Growth (%)	2.87	0.29	4.87	-7.34	2.87	3.81	-1.14	-0.84
Tanzania	Current	228	224	217	195	108	93	105	100
	Constant	166	165	168	168	168	167	168	168
	Growth (%)	-1.17	-0.48	1.57	0.48	-0.41	-0.36	0.28	0.34
Uganda	Current	276	265	301	306	209	220	156	239
	Constant	203	217	223	231	239	240	239	238
	Growth (%)	2.45	6.96	2.71	3.72	3.44	0.66	-0.44	-0.59
Zambia	Current	377	280	260	300	385	631	457	665
	Constant	595	578	569	582	556	538	504	463
	Growth (%)	2.45	-2.99	-1.56	2.42	-4.61	-3.21	-6.24	-8.08
Zimbabwe	Current	550	606	610	697	679	752	631	825
	Constant	807	803	770	815	833	827	830	706
	Growth (%)	3.9	-0.51	-4.11	5.85	2.25	-0.79	0.4	-14.92

Source: ECA Statistics Division, April 1994.

By the end of the decade, daily per capita food supply for the region as a whole reached 2433 kcal, as compared to 2250 kilo calories ten years earlier.

For Africa, and of all the regions, the nexus between sustainability and food security has proved to be much more complex, in particular African commodities and production systems which are extremely complex, and contrasts with the original green revolution's concentration on wheat and rice in the 1960s and early 1970s. The region has made little progress in increasing per caput food supplies over the last three decades. At the same time, dependence on outside supplies has grown alarmingly, not only to meet emergency needs but also to cover the growing structural deficit. This situation is clearly unsustainable. A drastic turn-around in the performance of the sector is crucial and this is not likely to come about at present levels of technology and management[8]. Yet, the tendency to import technology developed outside the region under different climatic and soil conditions has not always proven to be a successful and sustainable approach. Hence, the notion of technology transfer is a difficult subject and may be unsustainable for two reasons. Firstly, because it is likely to have been conceived under different agro-industrial, social, political and economic conditions in the industrial countries (capital-intensive and energy-intensive); and secondly, no company will give you technological know-how unless it is for its benefit. Thus, technologies developed under local conditions are needed, as are improved traditional and simple techniques and farm implements, while trying to forge new partnerships with relevant and qualified firms and research institutes in other regions. Low productivity lies at the heart of Africa's economic problem. For instance, Africa's rate of return on investment is estimated to be only one-tenth that of South Asia.

If we understand development to mean a socio-economic undertaking or process that leads to a higher quality of life or a cumulative increase in levels of consumption, Africa has not had any of these. Development should result in an increase in the standard of living, a richer cultural life, better health, social justice, peace and understanding among peoples, to contribute to a higher quality of life. Two of the major obstacles to rapid and sustained growth in the region are the economic structures inherited from the past and the institutional factors associated with them. Thus, in addition to the increasing poverty, Africa's economic crisis has also been characterised by the disintegration of the productive and infrastructural facilities. Apart from the decline of food and agriculture, most African industries have also been increasingly operating much below their installed capacities. The physical infrastructure built during the immediate post-independence era, has, to a very large extent, deteriorated due to poor maintenance and lack of renovation; while social services and welfare, especially education, public health and sanitation, housing, etc. have rapidly deteriorated and continue to decay.

TRENDS IN ECONOMIC POLICY ADOPTIONS

Heaven never helps the man who will never act. Sophocles

Against the above background, many African countries and their people have not been idle in the face of these adverse conditions, especially with regard to food security. During the past few years, there has been growing awareness among these countries that a major imperative

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8 Productivity, though, can be increased significantly through management even where input levels are low, i.e. productivity is knowledge- and management-intensive.

for agricultural and rural development is the need for appropriate national and international policies that will foster economic growth. *Per contra*, inappropriate national and international policies have been at the root of the failure of many countries to make progress. Policies followed over the last decades have not brought about the full benefits expected at independence. The region is still economically and technologically dependent. This better understanding of what was wrong with past policies has led many African governments to adopt major action-oriented socio-economic development strategies, introducing economic policy reforms and measures to remedy the situation. The most recent of such programmes are the OAU's Lagos Plan of Action (LPA); FAO-initiated Regional Food Plan for Africa (1978); the Harare Declaration of African Ministers of Agriculture; FAO's African Agriculture: The Next 25 Years (1986); Africa's Priority Programme for Economic Recovery 1986-1990 (APPER) in 1985; the United Nations Programme of Action for African Economic Recovery and Development 1986-1990 (UN-PAAERD) in 1986; and the United Nations New Agenda for the Development of Africa in the 1990s (UN-NADAF) of 1991. In addition, since 1980, at the height of adverse economic circumstances, an increasing number of African countries have adopted stabilisation and structural adjustment programmes (SAPs), usually with the support of the International Monetary Fund and the World Bank.

These adjustment policies which originated from industrialised countries have now become common and are firmly in place in Africa. But they constitute a sharp break with earlier nation-directed policies, and they do not provide an overall development strategy as required, instead they changed African mainstream development priorities such as those in LPA and UN-PAAERD. Thus, Africa has no shortage of development strategies, nor has the opportunity been rare but the ability to recognise it. UN-PAAERD was a novel compact between Africa and the international community, embodying mutually reinforcing commitments. In the unanimous adoption of UN-PAAERD by the United Nations General Assembly, hope was held that this compact would usher in a new era of international co-operation between the two parties. At the end of five years of the Programme, however, Africa's socio-economic conditions still remained precarious and the results of the programme fell far below expectations. But on the whole, Africa, on her part, undertook commendable efforts to implement policy reforms and structural adjustment programmes. On the other hand, a careful evaluation of the response of the international community to UN-PAAERD, regrettably, leads to the conclusion that it did not fully carry out its part of the compact. The additional resource flows (US$ 9.1 billion p.a. over UN-PAAERD period) were not forthcoming, instead, it is estimated that total net resource flows to Africa actually declined sharply in real terms.

As far as SAPs are concerned, the overall assessment has led to the conclusion that, although these programmes aim at restoring growth, these objectives cannot be achieved without addressing the fundamental structural bottlenecks of African economies. Average living standards in many of our countries are now below what they were at independence and most of the improvements in the physical quality of life achieved during the 1960s and 1970s have been severely eroded and by the 1980s, the record was almost everywhere one of abysmal failure, decapitalization, de-industrialisation and de-development in general.

It appears that these countries often (unwillingly) embarked upon the orthodox adjustment programmes/policies without an adequately developed institutional framework for agricultural policy formulation in particular, and economic policy formulation in general with serious

negative impact on a number of sectors. From the economic point of view, SAPs by their very design, assume that the classical instruments of control of money supply, credit squeeze, exchange rate and interest rate adjustments, trade liberalisation etc. which may be valid with well-structured economies, could bring about positive results in African economies characterised by weak and disarticulated structures. As evidence would now show, in many cases sustained economic growth has not materialised, the rate of savings, and therefore investment, rather than improve has tended to decrease, budget and balance of payments deficits have tended to widen and debt service obligations have become unbearable. The social impact has even raised more doubts and questions not only at policy making levels within and outside Africa, but also in different international fora[9].

Consequently, at the beginning of 1988, UNECA embarked on a search for an African Alternative Framework to Structural Adjustment Programmes for Socio-Economic Recovery and Transformation (AAF-SAP) that would address simultaneously both adjustment and structural transformation problems of the African economies. The African countries were called upon to increase their efforts in the search for a viable conceptual and practical framework for economic structural adjustment programmes. Africa needs fundamental change and transformation, the only question is what type of adjustment will bring about the Africa of our vision. AAF-SAP argued that these programmes had to be in keeping with the long-term development objectives and strategies of Africa.

Important changes in economic policy formulation emerged as a consequence of the difficulties of the economic development and imbalances (high inflation rates and unemployment, balance of payments bottleneck and budgetary deficits) of many African nations during the 1980s which left majority of governments with little choice but to adopt structural adjustment programmes accompanied by economic and financial stabilisation measures. These immediate financial constraints have in practice led to the neglect of urgent long-term development needs[10]. In previous decades, Government interventions in the process of

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[9] A survey on multilaterally financed adjustment programmes reveals an emphasis on positive foreign exchange availability in order to ensure debt-service payments. And the primary task of the Bretton Woods Institutions is now to manage debtor economies in such a way that these debts can be serviced. To accumulate this hard currency and service its debt, an African country must increase its exports (including the destruction of tropical forests) and reduce government spending - depriving their people of basic necessities. As a result, there have been extraordinary outflows from debtor countries as a whole equivalent to six Marshall Plans - US$ 1,300 billion between 1982 and 1990. As a group, the debtor countries began the 1990s with 61 per cent more in debt than they were in 1982. For Africa south of the Sahara, debt increased by 113 per cent during this period. With regard to Eastern and Southern Africa, the countries owed some $ 45 billion in 1991 excluding Angola and Djibouti. This is a rise of more than 203 per cent from about $ 14.7 billion in 1980. Indeed, until the end of the 1980s, the position of the IMF and the World Bank was that African countries needed to pay their debt in full, and that a confrontation over doing so could undermine international financial stability.

[10] Faced with economic crisis, governments have had to focus on resolving short-term financial and budgetary problems. The result has been that long-term problems, e.g. the transformation of economic and social production structures and human resource development have been pushed into second place. And development planning itself has become marginalised. The idea of planning on

economic development were conducted mainly through medium-term national plans - typically of five years which centred on public sector investment allocation. The document has also often been prepared in order to mobilise external resources with little or no linkage with the needs and concerns of the national community. Correspondingly, the training requirements for civil servants were largely on sectoral planning and project analysis.

The current thinking is unanimous on the need to link short and medium-term stabilisation programmes with longer-term strategies. Efforts presently underway will therefore need to be stepped up in order to renew and reactivate the planning process to ensure the transition from the short to the long term. In this regard, it is worth noting that since the early 1980s, the complex impact of policy instruments such as devaluation, taxation, pricing and subsidies have received greater attention. While, on one hand, wide range of enabling policy reforms has been made, on the other hand, the institutional basis of policy formulation including manpower, has tended to lag behind.

Agriculture occupies a major place within the economies of African countries. For most it provides livelihood to two-thirds or more of the population, constitutes the largest source of exports, and determines the pace of economic growth. The success of adjustment policies is accordingly measurable by its success in improving the agricultural sector. The efficacy of devaluation - a key instrument of macro-price policy - is dependent on performance of exports, which are often agricultural. Fiscal and trade policies impinge significantly on prices of agricultural outputs and inputs. Institutional reforms, another important aspect of adjustment policies, are frequently concerned with agricultural parastatals. Hence, even in their general approach, adjustment policies have much to do with agriculture. Furthermore, the adjustment policies adopted in African countries include agricultural sector-specific policies. These cover a wide range of policy instruments pertaining to credit, food security, producer and consumer prices, marketing, processing, subsidies of inputs, taxes and others.

Thus, there is need to improve the capacity at the country level for policy analysis to enable developing countries better discern the effects and impact of policy measures that they are adopting, to identify and design on the basis of a clearer awareness of such effects and impact the nature and timing of policy reforms, and implement effectively policy measures. Of course, the need for improving such capacity, which should be given focus by appropriate adjustment policies is, nevertheless a continuing one, as policy analysis, formulation and implementation are permanent functions of any government under any circumstance.

In countries where the agriculture sector predominates, appropriate policies, effective institutions and investment in the sector are almost equivalent to effective economic

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a longer-term is being increasingly accepted in the international community. In this connection, three levels of planning should be distinguished and linked, namely, long-term forecasting (covering a time span of one generation); strategic medium-term planning (from six to ten years) comprising *inter-alia* sectoral policies, a resource mobilization strategy, and a macro-economic framework; and short-term planning and budget programming, dealing with a restoration of short-term equilibrium. A national community should have an overall vision of its past evolution as well as its long-term future potential.

development policies. Agricultural policies have a great influence and they can make a big difference in performance.

For example, countries with similar agro-climatic and historical conditions and growth potentials can exhibit dramatic differences in performance depending on policies being pursued, or the lack of policy. Food production growth rates were better in Cameroon, Ghana and Liberia than in neighbouring Central African Republic, Guinea and Congo during 1980-85 period. Similarly, the performance was better in Tanzania and Kenya than in Ethiopia and Mozambique. Total food production increased much faster in Libya, Egypt and Tunisia as compared to the other North African countries during the same period.

Generally, agricultural success stories are characterised by policies relating to the application of science to boost yields; investment in the factors that step up local production and consumption; and the shredding of policies that hurt farmers. African farmers must be given all the incentives required for increased food supply including improved general terms of trade for agriculture. Agriculture and rural development are at the centre of poverty alleviation. Most of the poor people depend on farm incomes, while a large percentage of poor people's income is spent on food. And yet, in general, rural productivity (and income per capita) are estimated at only 30-40 per cent of urban levels.

With the drive to democracy in Africa, new expectations are created and Africa is once again on a new learning curve. However, democracy will not be sustained without sustainable economic growth and a more equitable and employment creating development path. Hence, despite the sombre recording of the economic deterioration in Africa, most African countries are engaged in difficult and often politically risky policy reform programmes. Despite the difficulties involved, a majority of them have adopted policy reforms designed to improve overall economic management and performance, to increase the efficiency and effectiveness of the public sector, to give greater priority to channelling resources to the agricultural sector on which the majority of Africa's people depend for their livelihood.

In this regard, we must draw on the lessons of this very moderate success, which is the best that can be said of the reform programmes currently in place in Africa. It must be recognised that they have not achieved their objectives. So, more must be done. But some recent developments in agricultural policy and planning strategies in a few countries tend to reflect some of the issues addressed in the above-mentioned programmes and plans and are courageous and commendable. For instance, in Mauritius, there are apparent moves to phase out sugar export taxes with a view to encourage expanded investment in sugar production. In Seychelles, a package of policy incentive has been put in place with the medium-term objective of privatising the agricultural sector.

However, efforts by the African countries to pursue and deepen the reform process cannot be sustained indefinitely in the face of an adverse external environment. No wonder, therefore, that inspite of all the measures taken, the overall performance of the economies of African countries remains unsatisfactory. The combined adverse effects of domestic structural impediments and tightened external resource constraints have outweighed the positive influence of policy reforms. In many countries cuts in government expenditures and public wages freezes and lay-offs have resulted in severe personal hardship for those affected. And both the quality and the quantity of health and education services have been declining too.

AFRICAN POLICY AGENDA AND POLICY RESEARCH IMPLICATIONS

> *Your advice is important because you are involved in different ways in practical development work. There is not much dispute on what needs to be done; endless seminars have been organised, and endless papers written. I look to you for practical advice on how development in Africa can be better co-ordinated and focused. What Africa needs is practical solutions.*
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> *UN Secretary-General Boutros Boutros-Ghali on African Development to Panel of High-level Personalities, Geneva, 28 December 1992, UN-NADAF.*

African countries need to develop their own policy agenda more effectively than has been the case in the past. Inspite of efforts by African institutions such as the OAU and UNECA to co-ordinate African positions in global development issues, it is foreign experts who occupy the centre-stage of policy making in many African countries. African governments have largely failed to act on Africa-initiated programmes and plans mentioned in Section II above, documents which have clearly identified many of Africa's strategies for change. They have failed to act on the decisions reached at different levels of their own continental meetings, including Summit Conferences. The practice of policy reform in developing countries rarely conforms to neat academic theories. Political considerations and effective leadership are often as important for success as are the right policy objectives and the sequence of reform. And yet only a few governments engage in public debate about development priorities with their own citizens, involving them in strategy-policy-praxis design and articulation.

Discussions aimed at defining alternative development for Africa's future and reverse the economic slide, must give emphasis and special priority to the articulation of an African rather than a First World perspective on the cause of events in Africa. For the most part, African countries have been on the receiving end of fads, i.e. currently in favour but nonetheless transient ideas in development strategies especially concerning agricultural action programmes. The purveyors of these fashionable and quaint ideas, fundamentally inimical to progress, are for the most part donor agencies. This is not surprising since the internal professional and intellectual community in Africa has been ineffective in defining problems and in offering viable domestic policy options, quite apart from the fact that many governments are themselves part of the problem.

The unsatisfactory macro-economic performance of the African economies reflect both internal and external constraints and structural rigidities. With regard to external constraints, a case exists for a major restructuring of development co-operation policies of the past, the development policies of the 1950s (technical assistance); 1960s (trade, not aid); 1970s (NIEO[11] plus basic human needs); and the 1980s with adjustments which have obviously been inadequate.

Agriculture is without doubt one of the most important stabilising factors in the continent. It is therefore the logical starting point of any strategy of getting the region out of the doldrums

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[11] The New International Economic Order (NIEO) that never was, is precisely because there is no such thing as world economic disorder - what exists is an unequal sharing of wealth. In this respect, the world is quite orderly.

in which it finds itself. It is up to the leaders of Africa and the international agencies involved in African development to ensure that this challenge is accepted. The alternative is hunger, famine and destitution.

The primary role of the agricultural sector is to supply food, fibre and beverages to the population, and to generate employment, income and foreign exchange. This simple fact elevates agriculture to a position of importance in any community. Taking into account Africa's ever growing needs of our people, sustained agricultural development in our continent is undoubtedly an essential prerequisite for an acceptable economic, political and social order, as well as for the stability of society in general.

General Development Policies and Agricultural Development

Macro-economic policies have an important influence on the development of the food and agricultural sector and food security, both in the short and longer term, through their effects on prices, incomes and employment. These non-agricultural and economy-wide policies such as industrial protection and fiscal policies are highly crucial to food security; but so are food- and agriculture-related policies because of how they affect the speed of urbanisation (through rural out-migration) and the provision of food itself. The direct and indirect protection and taxation of economic sectors determine their relative competitiveness, which, in turn, determines resource flows in the economy. The choice of development strategy is highly relevant for the long-run effects of macro-economic policies on economic growth and alleviation of poverty (Mellor, 1986).

Agriculture has usually been on the losing end in many developing countries owing to a focus on industrialisation that was largely financed out of agricultural taxation. The effect of such an industrialisation policy on urbanisation was to encourage excessive and untimely outflows of people from agricultural areas to urban areas. Yet, agriculture can function as a vehicle of growth if labour productivity and employment in agriculture are enhanced through new technologies and diversification. If this is done, it can be expected that one significant spur to urbanisation that aggravates poverty - namely, rural migration - will be reduced and food security will be increased. The deleterious ways in which the structural maladjustments of the 1980s and early 1990s which had severe effects on the lives of people in the developing countries, have emphasised the importance of macro-economic policies in ensuring food security.

The macro-economic policies should therefore be designed to strengthen rather than counteract the incentives for agricultural development provided by means of sectoral policies. In this regard, structural adjustment policies for correcting macro-economic disequilibria would need to put greater emphasis on growth-generating aspects by removing constraints and bottlenecks to growth. The design, the sequencing and the implementation of such policies should take into account social costs, in particular adverse effects on nutrition, health and education. These costs must be minimised in order to safeguard the human resources potential on which development depends.

The role of the public sector in economic life also need to be viewed from a pragmatic standpoint, giving serious consideration to widely differing national circumstances, experiences and capabilities. African governments, often prompted by donor agencies, have been too

inclined uncritically to adopt uniform policy solutions, however unwieldy and inappropriate, recommending technologies and approaches that overlook the diversity of different situations. The alternative to central planning is not the total abandonment of government's potential facilitative or development-generating roles in such areas as technical, human and institutional infrastructure conducive to a thriving agriculture and its sustainability. There is room for policy both of laissez-aller and laissez-faire in the handling of public affairs. The issue will be to link all these operationally, including the reality that government itself will ultimately determine the role of government in agricultural development[12].

Meeting food production demand in years to come suggests the importance of appropriate policies and approaches. The broad field of knowledge to support increases in rural output, and the social and economic advance of rural people should encompass the following essential sets of activities: people-centred policy and planning; environment and renewable natural resources; genetic resources; production and production systems; protection against pests and diseases; external inputs; and the management and monitoring of performance, among others.

For many countries, the expansion of the cultivated area - historically the major source of increased production - is no longer either an advisable or plausible solution, in particular if we consider the environmental trade-offs associated with such expansion. Biotechnology offers some hope. Speeding the plant-breeding process could result in crop varieties that resist disease or insects more effectively, and adapt better to arid areas, than current varieties. It is worth noting, however, that these biotechnology-generated gains are unlikely to be distributed uniformly within the sector. The poorest individuals inhabiting agriculturally marginal areas stand least likely to benefit. IFPRI research suggests that increasing the productivity of land already under cultivation, even in highly productive areas, through better agricultural policies, offers the best hope for meeting future food demands.

Research in Brazil, for example, has found vast differences in productivity for virtually all crops, suggesting latitude for productivity gains with existing technologies. Traditionally, much of this variation in productivity has been attributed to the differences in ecological conditions faced by farmers. But do ecological differences account for most of the variation in productivity? To find out, IFPRI researchers, in collaboration with Brazilian researchers devised and implemented a method for categorising Brazilian farmland that allows researchers and policy makers to control for differences in soil type, climate, climate variability, and rainfall - the key determinants of agricultural production. By identifying relatively homogeneous land groups, it was possible to look across these groups to assess the influences of different ecological conditions on agricultural productivity, and within homogeneous land groups to highlight the non-ecological factors affecting yields. As expected, differences in productivity across ecological zones were substantial. Areas with better soils, more temperate climates, and

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[12] With regard to planning in a market economy, the planning approach should be to indicate in advance to the public and the business sector what is needed to encourage and facilitate economic development (i.e. indicative planning), rather than to plan for actual production, distribution and consumption targets. Indicative planning recognizes forces in the market, macro-economics, legal framework, and corrects market imperfections and failures, e.g. measures to prevent costly monopolies. Government intervention provides public goods and services for which profit prospects are low and risks high, e.g. in the development and use of new technologies.

more regular rainfall dramatically outproduced areas with poorer soils, warmer climates, and less than appropriate rainfall patterns, by as much as 300 per cent.

However, this research also identified large differences in agricultural productivity within these relatively homogeneous ecological zones; differences so vast that they could only partly be explained by remaining differences in the underlying natural resource base. For example, corn production in 1980 within the north-east ecological zone - one of the poorest areas in Brazil - varied from a high of 1.4 metric tons per hectare to a low of 0.1 metric ton per hectare. Variations of this size in a fairly homogeneous agro-ecological region are not due to improper classification of ecological characteristics, especially since other agro-ecological zones showed similarly large yield variations. Rather, these vast differences in productivity within common ecological regions are primarily due to very different production techniques being used by farmers to produce the same products. This suggests that if the same ecological conditions support both sophisticated and rudimentary technologies, there is room for increasing productivity within agro-ecological zones by spreading the use of existing modern technology.

But what factors influence farmers in deciding which type of production technology to adopt? Research suggests that agricultural policies, including policies associated with infrastructure, agriculture extension, availability and cost of agricultural credit, and the like, greatly influence farmers' decisions as to choice of techniques. In the Brazilian case, changes in the policy environment in the areas studied could dramatically broaden the diffusion of more sophisticated production technology to substantially increase output per hectare of virtually all agricultural production. The implications for Africa are clearly obvious. The fundamental supply problem in Africa is to match a set of potential technologies with appropriate policies. There are considerable gaps in the knowledge needed to choose and effectively implement policies to ensure sustainable agricultural development. Research will be required on how policies can be adapted for local implementation, in particular problems with policy implementation in Africa; criteria for choosing among policies; and the synergistic effects of different parts forming the programme.

Food Policy

Food policy is of crucial importance in the process of social and economic development. In confronting their food and agricultural problems, therefore, African governments will need perceptive, in-depth analysis and well-trained local analysts to do so. Supporting the African development of such analytical processes is essential if we are serious about improving food and agricultural policy because sound development policy analysis plays an important role in food policy design.

Food policy embraces a large number of separate aspects, but together they cover some of the most important and sensitive issues which concern agricultural development in African countries. These issues can be grouped under these main headings: food consumption trends; nutrition policy; reduction of food losses; and food security systems. All these four areas are particularly amenable to policies that induce technical change.

Food consumption patterns, reflecting in particular preferences for wheat and rice over traditional cereals such as millet and sorghum, have been changing in many countries. The new pattern of demand is particularly associated with higher income urban groups. It is only

partially met at present by internal production forcing many nations to increase food imports, thus increasing the demand for foreign exchange. Even where domestic production of the preferred food is feasible, the farming techniques adopted (typically involving large mechanised farms) cause a significant increase in the use of the scarce factors-capital, foreign exchange and high-level management. Urban bias in some countries, by raising urban incomes and encouraging rural-urban migration, makes the situation worse. So too does an over-valued exchange rate, since the imported foods become underpriced relative to domestically produced ones.

Corrective policy measures to mitigate such trends include restrictions on imported food through import duties, quotas and foreign exchange rationing, encouraging the domestic substitution of imported foodstuffs (especially those using land and labour-intensive production methods), requiring a proportion of local cereal flour to be incorporated in cereal products and, above all, bringing the exchange rate to a realistic level.

With regard to nutrition policy, very few countries in the region have clearly defined policies for nutrition. The main causes of endemic malnutrition, which especially affects infants and children, are poverty resulting from inadequate production and resultant low-incomes relative to the cost of food. Also, in areas where bulky staples are consumed, such as bananas or cassava, there is often a lack of understanding of infants' dietary requirements.

Experience with clinical treatment of malnourished infants has shown it to be both expensive and ineffective, particularly when medical problems intervene as they surely do. Nutritional policy must be built into the general development programmes aiming at raising the incomes of the poorest groups. In addition, nutritional training in the education of both girls and boys particularly in the first three years of primary school when attendance is highest and those particularly in need can be reached is a worthwhile approach.

As far as food losses and related problems are concerned, improved handling including storage methods would greatly contribute to reduction of post-harvest losses. Traditional storage losses vary especially with the climate and crop type. They can be as low as 3-4 per cent in respect of millet and sorghum in dry savannah climates. The worst problems and biggest gains from improved practices are in bulk storage in the modern sector, because of poor infestation control and stock management; scarcity of imported chemicals and bags due to foreign exchange difficulties; and inappropriate technology.

The fourth area under food policy deals with food security systems. Food security implies universal access to and availability of staple food supplies. Access to food is dependent in part on growth in real income and reduction of poverty. The cheapest source of food is normally from a country's own agricultural sector, unless the exchange rate is overvalued or the opportunity costs of alternative uses of agricultural resources exceeds the value of food production. This is unlikely to arise in land surplus countries, but in certain countries, such as Kenya and the island economies of the Comoros, the Seychelles and Mauritius, increasingly difficult policy choices will have to be made within the agricultural sector, especially between food and cash crops, and between agriculture and other forms of land use.

Although policy objectives do vary from country to country, some countries of the Eastern and Southern African subregion have clearly defined food reserve policies. The policies

of these countries (Botswana, Kenya, Lesotho, Malawi, Tanzania, Zambia and Zimbabwe) cover handling emergencies; stabilising prices; supplying domestic and export markets; organising distribution; meeting international commitments such as long-term contracts; and strategic considerations. Food reserves in most countries of the subregion, however, remain at levels that leave little or no margin for food security.

It is important to make a clear distinction between long-term and short-term elements of food policy and food security relationships. Short-term elements involve mainly food supply instability and insecurity - largely concerning food imports for the urban population[13]. The food problem is, in reality, basically an urban problem.

A rational long-term food policy should include these basic goals: a long-term dynamic growth in the food and agricultural sectors (i.e. an increase in rural output and incomes); an improved income distribution, primarily through job creation; a decent minimum standard of living and good nutrition; and security against famine, extreme food shortages and uncertain world food supplies and prices.

Food development policy analysis will of course, be powerfully influenced by political, social and other considerations as well as the capacity to implement the results of the analysis. The food and nutrition problems are also inter-disciplinary and multi-sectoral in nature. A guiding principle for choosing policies must be their cost-effectiveness, given constraints on fiscal and foreign-exchange resources experienced by many African countries. For example, one central policy dilemma has to do with food price subsidies widespread in both developing and developed countries. At the centre of the dilemma are the demands for protection by rural producers and the demands for subsidies by urban consumers. These subsidies, especially in developing countries have long tended to benefit the urban populations. Urban biases are glaring when you look at Africa's food price controls and the policies of food marketing parastatals. In 1980, for instance, the marketing subsidy for maize meal was about 10 per cent of the Zambian government's recurrent expenditure, while in 1988 this subsidy was 65 per cent of the total expenditure on maize (Pearce, 1991). These income transfers from food subsidies tend to raise the real income of low-income households. Subsidies can therefore be a substantial policy instrument for improving food security for this group whose income and price elasticities for staple foodstuffs are high.

The role of the food policy analyst (or policy adviser) is, therefore, to help identify those policies whose use will minimise the conflicts between direct goals; and to indicate the likely consequences of a given choice of instruments. An important challenge to agricultural-sector analysts is how to integrate knowledge of farm systems into the formation and analysis of food and agricultural policy: the living systems (agricultural systems) are not only extremely complex but also poorly understood. A considerable fund of understanding of the different production systems, conditions and motivations of people is therefore needed. Hence, the urgent need for capacity development.

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[13] We must distinguish between emergency food aid/import needs which are occasioned by real emergency, and structural food aid needs resulting from structural rigidities problems - L-R food aid/import needs. We must further make the distinction between "transitory food insecurity" (famine) and "chronic food insecurity" (persistent hunger).

Capacity Building and Economic Management

A major missing ingredient that has been responsible for Africa's poor economic performance is the lack of adequate indigenous capacity in several critical areas of human, institutional and infrastructural development. Capacity building is an enormous and complex undertaking, which will need to be sustained over several decades and with significant financial outlay. Capacity building is probably the only solid platform from which Africa can be launched on to the path of sustained recovery, accelerated growth, environmentally sustainable development, equitable distribution of socio-economic opportunities and steady reduction of poverty. Development is not solely a matter of economics, pulling a few economic levers here and there. Pointed attention must also be paid to institution building, popular participation and an end to circumscribed freedoms. We have now come to appreciate that participation by citizens in all of the institutions of a society - political as well as economic - is a prerequisite for development.

The creation of adequate skills is necessary for successful development. Many domestic constraints are linked to weaknesses in education, training and management systems. Further, the ability of African countries to fund human resource development adequately is limited by the current economic crisis and the impact of adjustment programmes. Although in some cases school enrolments have risen, the quality of education has not kept pace with the demands of the labour market, particularly in mathematics and science. Institutional decay is symbolised by the poor conditions of once world-class universities in Africa. Yet, the development of the region's human resources for technology, economic management, and policy analysis and implementation must be made a major object of both national policy and of external financial support. Human resources are not Africa's only potential. The continent has some of the most productive land and mineral resources in the world, not to mention oceans, lakes and rivers.[14] But Africa's full potential can only be realised once the economies have recovered and structural transformations have been achieved.

Policy analysis must evaluate the capacity to implement and manage the policy on a regular basis. Limited capacity to carry out this analysis is a major constraint in all countries, largely as a result of ineffective administration of development, i.e. capacity to analyse and implement. When confronted with the problems of poverty and hunger, therefore, food development policy analysis must concern itself not only with agricultural production and rural development, food consumption patterns and nutrition, but also the national capacity for macro

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[14] It is clear that Africa has the potential for recovery. According to estimates, Africa has oil reserves amounting to 55 billion barrels; 5,900 billion cubic metres of natural gas; 88.5 billion tonnes of coal. It has also 1.7 billion tonnes of uranium reserves; 200,000 megawatts of hydro-electric potential; and great potential in solar and wind energy and biomass and animal energy - 200 million horses, donkeys, camels and cattle. That so far, the Continent has failed to use these to sustain its population, leaving it in abject poverty, shows irony in developmental priorities at continental and global levels. Africa has been talking too much of the need to use its resources for the advancement of its peoples, and doing too little about it. Some 4,200 billion cubic metres of fresh water flows out of Africa into the ocean every year - 10 per cent of this water would increase Africa's food production by 10 per cent. Only 3 per cent of Africa's hydro-electric potential has been harnessed; and fuelwood efficiency, which could be 20-30 per cent, is currently about 10 per cent.

policy planning and implementation. Macro-economic forces outside the agricultural sector are too pervasive and too powerful, hence, when they work at cross purposes to micro sectoral strategies, they create an unfavourable macro-economic environment and can, therefore, erode even the best laid down plans. Likewise, policy actions in other sectors of the economy that have greater impact on the agricultural sector than policy intervention in agriculture must also be addressed.

One such area is the importance of the availability of technology. It is accepted throughout the world that a thriving agricultural sector can be maintained only if technology keeps track on a continuous basis. The greatest factor behind Africa's tale of death, starvation and malnutrition is the region's "under developed" agriculture. Technological change means not just higher agricultural productivity; it will impact the entire system of technical, socio-economic, institutional and political arrangements. There is, therefore, little question that policies for increasing economic growth, especially increased agricultural productivity, must provide the bedrock for future development. Increased yields will call for an urgent need for higher investment in agricultural research and technology to ensure enhancement and stabilisation of yields. Increased yields will also mean rational utilisation of natural resources a sine qua non for sustainability in food production. Investment aimed at improving the capabilities of the poor, by putting most of Africa's eggs in the basket of small-holders will lead to the achievement of short-term goals in tandem with long-term development. This is what has happened to such countries as different as China and Indonesia, Malaysia, India and Thailand.

The inadequacy of current food supplies is a testimony to past investments in agricultural research. This trend is unfortunate on several counts, including the fact that high rates of return have been documented for investments in agricultural research during the 1980s and early 1990s, including Africa. Secondly, there is a real time lag between agricultural research and increased production. The sustained growth of food and agricultural production is a long and exacting task to which everyone should contribute. For these reasons, Africa should never be hesitant to invest in the development and transfer of agricultural technology. Studies in the USA have shown that the return on investment in agricultural research varied between 35 per cent and 230 per cent. In South Africa, the benefit/cost ratios have been shown to be around 20 and 270.

The relevant technology for African agriculture will be the one that makes optimum use of available domestic resources. Agricultural policies and programmes should place emphasis on smallholder agriculture which holds the key to the transformation of the more abundant resources of labour and land while economising on the more scarce factors such as capital and foreign exchange earnings. The technologies in developed countries tend not only to be urban-biased but also large-scale, capital-intensive and import-dependent. The tendency to import technology developed outside the region under different climatic and soil conditions has, therefore, not always proven to be a successful and sustainable approach. Indeed, due to past policies, African countries have lagged so far behind in technology that today they are unable to choose what is best suited to their development needs. As a result, the continent is littered with inappropriate and confusing technologies.

In seeking to acquire technology through indigenous efforts (ability to assess, select, assimilate, use, adapt foreign technological knowledge and create this technology to suit local conditions), the central issue in an African strategy should be to strongly enhance the region's

capacity to borrow, to build upon it, and thereafter to encourage the development of the required domestic capability in these areas. A Green Revolution for Africa would require greater efforts in terms of scientific manpower, institutions and financial resources considering the region's wide diversity in agro-ecological zones and the wide range of relatively unimproved staple food crops, each of which requires sustained research.

Human capacities (policy makers, researchers, extension agents and farmers) are also needed in the specific case of food security and self-sufficiency, institutional and infrastructural capacities. Capacity-building in terms of human resources involves education and training, managerial competence and participatory capabilities. Organisationally, institutional capacities required include sound decision-making, resource allocation and the management of socio-economic processes to be accompanied by a working physical infrastructure as well as strong non-farm sectors that support the development of agriculture.

Other Sectors Supportive of Agriculture

While recognising that a major breakthrough in African development can only be brought about through structural transformation of the food and agriculture sector, it must, however, also be emphasised that the interaction between this sector and other supportive sectors in a mutually reinforcing manner, is a *sine qua non* for long-term and sustained overall growth and development. Accordingly, apart from agriculture, which has been accorded the highest priority, other priority areas envisioned by African leaders in the Lagos Plan of Action, APPER/UN-PAAERD and the Industrial Development decade for Africa (IDDA) include industry, energy, science and technology, natural resources, economic co-operation, transport and communications, human resources and entrepreneurship development, good government, and trade and finance, all of which support food and agricultural development. APPER/UN-PAAERD's analysis, in particular has developed a strategy which assigns complementary roles to these important and supporting sectors, including the role to be played by the large number of subsistence farmers on which the recovery efforts should concentrate.

The structural links between agriculture and these supporting sectors will be essential for increased agricultural productivity and efficiency. For instance, the development of tools/machinery, fertiliser, pesticides and vaccines will be necessary for rural development especially since the majority of African farm households depend on hand tools and animal-drawn equipment to produce their food. Any shortage of these inputs must therefore be avoided. The shortage condemns farms household to tedious and the least efficient working methods which tend to lock them into a treadmill of poverty and drudgery. Unfortunately, in the 1980s industry declined in many countries, mostly as a result of poor agricultural performance, excessive external dependence for inputs concurrently with plummeting foreign exchange earnings and rising debts. The African industrial enterprises are yet to be linked to domestic resources. There is also a serious lack of industrial skills. The mining sector has also resulted in massive distortions in incentives that have hindered the development of agriculture and industry. Between 1980 and 1986, growth in manufacturing virtually stagnated in Africa. Its share of GDP was about the same as it was in 1965 at 10 per cent. In essence, therefore, there appears to have been a process of de-industrialisation during most of the 1970s and 1980s. In the subregion, the most seriously affected countries were Madagascar, Mozambique and Tanzania.

Overall, Africa's industrialisation strategy has been of little assistance to agricultural development. Notwithstanding the priority accorded to industrial development in the majority of African countries, the industrial plants are operating at about 20-40 per cent of their installed capacity. As a result, the industrial sector has not provided the expected inputs required to raise agricultural productivity nor has it generated surpluses for further investment or job creation. It has been of little use as a market for the agricultural sector. Instead, it continues to be a net user of both domestic and external resources.

The activities of the different Recovery Programmes currently underway in many countries are, therefore, aimed at addressing this problem. The objectives of these programmes include the rehabilitation and transformation of the industrial sector as well as the overhauling of the other sectors such as transport and communications, trade and finance, including resource flows, natural resources and energy development and utilisation, human resources planning, and science and technology. In Kenya, for example, the stated strategy for industry is to support and promote rapid agricultural growth and a dynamic rural economy. Among the top priorities of the Ministry of Industry is to enhance the exploitation of local resources namely, cotton, sugar, hides and skins processing. In Mauritius, the industrial sector is led by Sugar Milling and the Export Processing Zone (EPZ) which concentrates on textile products. Tanzania's programmes in industrial, transport and communications, energy and construction sectors aim at assisting the activities in the food and agricultural sector. The country is also to improve the management and productivity of the industrial sector with a view to raising industrial production to 60-70 per cent of installed capacity.

There are also major policy shifts in most of the other countries, also aimed at paying greater attention in support of the productive sectors and those that are supportive of agriculture. In Zambia, for example, the main aim is to overcome the present transport and distribution problems through the development of road network. Efforts are also underway to restructure the manufacturing sector in order to increase its reliance on domestic raw materials.

With regard to energy supplies, this has been inadequate and unreliable and thereby contributing to slow economic growth while the increasing demand for household wood fuels has resulted in serious and chronic deforestation and degradation of the environment. About 80 per cent of Africa's population depends on woodfuels (fuelwood, charcoal, etc.) for energy. Wood accounts for four-fifths of gross energy supply for most countries. Through price mechanism for woodfuels, Malawi is encouraging the conservation of the ecosystem and interfuel substitution, as well as improved co-ordination of energy sector development in order to meet future fuelwood demand. Similarly, Uganda intends to improve and develop new sources of woodfuels and to promote the development and use of renewable sources of energy.

One should underline the fact that most economic reform programmes continue to put emphasis on industrial growth and fail to take the issue of how industries will access technologies to achieve the needed growth. If structural transformation is to succeed, it ought to go beyond the mere exercise of reforming the economies to deal with the fundamentals of technological base. We are in a world where technology and manufacturing go hand-in-hand, except in Africa.

International Agricultural Trade

There are important issues which must be tackled afresh if the economic development of Africa is to proceed. They are: external debt, trade including regional and subregional integration, and the diversification of African economies. External debt is a millstone around the neck of Africa and for most countries of the region and the situation is clearly unsustainable. The excessive burden of external debt has resulted in much of the export earnings continuing to be absorbed by the servicing of external debt. For many, the external debt is higher than GDP.[15] This burden is a major obstacle to flow of private investment to Africa.

Africa relies principally on the export of its raw materials to further its development and to pay for its imports. The raw materials produced by the region's agricultural sector are mainly tropical commodities such as coffee, tea, cocoa, cotton and palm oil. However, demand for these goods in the developed countries is largely satisfied and shows no sign of increasing. Technology has also made it possible for less requirement of raw materials in these industrial countries, e.g. less cocoa used in chocolates. This has led to a continuous fall in their market prices, prices that neglect real costs and real returns. A simple comparison of two sets of figures provides an eloquent testimony. Thus, while the value of African agricultural exports increased slightly between 1980/83 and 1990/92, export volume has continued to fall since 1961. Over the last decade, prices of agricultural, fishery and forestry products exported by developing countries have declined in real terms by 36 per cent. For example, compared with 1979-81, the purchasing capacity of coffee and cocoa exports has declined a decade late r by 45 per cent and that of natural rubber by 25 per cent[16]. In a country like Uganda whose economy is based primarily on agriculture with coffee by far the largest export, small changes in the world price of coffee make large differences in the country's export earnings and in its economy. The price of Ugandan coffee has declined steadily in recent years, to $ 0.82/kg in fiscal year 1992/93 from $ 2.05/kg in 1987/88. Overall, Uganda's terms of trade have

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15 Africa's debt rose sharply during the 1980s, when prices of its commodity exports began a long and steep decline. By 1992, the continent's total debt of some $ 290 billion was about two and a half times greater than in 1980 and it is now 90 per cent of its GNP. For Africa south of the Sahara, it is 110 per cent of the GNP. By 1993, the region's total external debt had reached $ 302 billion. To service this debt, Africa paid over $ 26 billion to its creditors in 1991 - 30 per cent of its export earnings. For a number of countries, it is 50 per cent. Debt service is the priority of the creditor countries that determine IMF and World Bank policy, presently the most powerful political agencies. The debt crisis has given creditor countries the chance to intervene in the management of debtors' economies using these agencies. Debtor governments have from time to time called for debt relief but have never collectively confronted the creditors. But this debt should really not be seen as a national problem. Different social classes in debtor countries have vastly divergent interests and are unequally affected. The crisis hardly affects the debtor-country elites who are usually insulated from the distress. It is therefore not surprising that the pressures exerted by NGOs in both North and South have so far failed to alter basic debt-management policies.

16 When as many as 115 or 120 countries compete for export markets in some 20 countries, the obvious rules must apply: the few importers will dictate the terms, prices of exporters' goods will fall. At the beginning of the 1990s, Northern purchasers of raw materials found their prices lower than they had been at any time since the 1930s.

deteriorated by about 65 per cent over the last six years. As a result, its export earnings have been more than halved, dropping to $ 157 million in 1992/93 from $ 384 million in 1987/88.

In 1988, the whole of sub-Saharan Africa with more than 400 million inhabitants, had export revenues below those of Singapore, a country of 2.5 million. Despite the favourable provisions of the Lome Conventions, African countries have not achieved any major shifts to new exports with better growth prospects than traditional lines. This contrasts sharply with development in South Asia where primary products fell from 63 per cent to 36 per cent of total exports from 1965 to 1987. In fact, dependence on primary commodity exports has been intensified. Between 1970 and 1989, the share of coffee in the total merchandise exports increased from 50.4 per cent to 97.9 per cent in Uganda, from 59.4 per cent to 69.5 per cent in Ethiopia and 54.4 per cent to 66.6 per cent in Rwanda. Over the same period, dependence on cotton export increased from 26.1 per cent to 86.7 per cent in Burkina Faso, from 13.5 per cent to 49.8 per cent in Mali and from 62.4 per cent to 66.9 per cent in Sudan. Tanzania's dependence on the export of coffee and cotton increased from 30.2 per cent in 1970 to 65.8 per cent in 1989. The dependence of Guinea on bauxite exports rose from 9.05 per cent in 1970 to 93.81 per cent in 1989 while the dependence of Togo on phosphate rose from 24.4 per cent to 62.1 per cent over the same period. It is only in a handful of countries that diversification to new lines of production has been attained. Between 1970 and 1985, only Chad and Mauritius managed to diversify into new export products. Furthermore, the high potential for increased export processing in African countries has not been effectively harnessed. For example, Zambia exports its copper in refined form, thereby adding values to the mined ore. But it does not convert refined copper into fabricated products (example, wires, tubes and pipes). Coffee from Tanzania is exported in green or roasted form but not as essences or extracts. In addition, African economies tend to have high wage rates while productivity remains at a low level. Compared to many Asian countries, where wage rates are lower and productivity is higher, African countries are at a disadvantage in exporting labour-intensive manufactured products. Rapid export expansion is also constrained by the increased production of substitutes. The current sluggish demand for cotton mirrors both the natural weakness of demand for textiles and the increasing challenge of synthetics. Copper is now coming under increasing threat from substitutes: aluminium for electric conductors, fibre optics for telecommunications systems, titanium for heat exchangers, and plastic and aluminium for car radiators and other components. (Abebe, 1994).

The farm sector is a very difficult one. A few years ago, American farmers committed suicide, bankers committed suicide, etc. because prices were very low. It is difficult to draw up your plans based on estimated improvement of international agricultural world market prices. UNCTAD introduced stability in the commodity prices, but the effort has been a complete failure. Nobody knows what to do; and there is no political authority to ensure control of supply and demand. Hence, the imbalance will remain.

Aid is obviously not a viable solution and, today, only serves as a derisory palliative. But even if sufficient aid were provided, should Africa be made permanently dependent on handouts? This should not be Africa's vocation, nor can it be the ambition of its governors or its people. In order to progress, Africa needs to be in a position to earn enough from its labour and its trade, and this calls for higher prices. In other words, their national policies need to be buttressed by favourable external economic conditions in today's interdependent world.

But since the imbalance is likely to continue, the question then becomes how does Africa live with this problem in such a way that Africa minimises cost to its society? One way would be a strong programme of diversification (production and markets), including a balance between export and food crops. In addition, there is room for vertical integration in Africa. There is also limited room for preferential access to African partners' markets, while joint ventures may probably be the best way of co-operation. Africa's exports to the European Union are declining both in volume and value. Africa's salvation lies therefore in regional integration. Africa must define its needs, organise itself by asserting its identity, and managing its own affairs. We live in a time of free trade areas, common markets and an increasingly global economy. The future belongs to economic blocks. African countries will have to join forces if they are to compete effectively in world markets.

PRINCIPAL CONSTRAINTS TO POLICY PLANNING AND IMPLEMENTATION

When discussing long-term constraints to agricultural development, one should not forget that the African history has been a turbulent one where the African societies have had to weather many storms and cope with some of the most harsh situations, arising from external factors as well as internal strife and conflicts. Apart from slavery and forced migration, countries have suffered colonialism, and recently apartheid and the acts of destabilisation in Southern Africa.

The inadequacies and the unsatisfactory nature of both economy-wide and agricultural structural domestic policies have also been a major factor constraining agricultural development. These policies have evolved in such a manner which discourage growth of agricultural output and incomes of the rural sector in general. An inefficient macro-economic framework has led to the exploitation and neglect of the agricultural sector and rural areas. The organisational, technical and economic inefficiency in the urban sectors and government, structurally continues to distort the development of this sector. The agrarian structure and land use policies have usually been inconsistent with the interests of the peasant farmer, who still dominates the agricultural scene in these countries. There is, therefore, hardly any country which has yet, in real terms, succeeded in removing the structures that impede the development of the traditional subsistence-oriented small farmer with his livestock and arable farming.

Quite often, the problem is not one of defining national food policy objectives but moving getting from planning to efficient implementation of these objectives. For policy-makers to influence the process of change, they must understand the environment and behaviour of food producers and consumers - how programmes and policies affect the food system (food production, consumption, marketing, food prices for farmers and consumers)[17]. This will enhance the ability to identify the right policy instruments.

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[17] We must emphasize the need to strengthen analytical capacity within national governments for dealing with competing political pressures from consumers and producers. The dual role of food prices-determining food consumption levels (consumers, especially among the poor), and the adequacy of food supplies through incentives to farmers - raises an obvious dilemma for food policy analysts. The inverse impact of food prices on producers and consumers creates significant dilemma which, if managed, while trying to achieve all the above-mentioned food policy objectives, is the essence of a successful food policy. That success

Although countries have come to the realisation that sound policies and strategies are essential for growth and development, this awareness has not been matched by the implementation rate of these strategies. The limited success in promulgating agricultural plans and policies points to the existence of basic impediments and constraints. As mentioned earlier, one of the underlying causes of food insecurity is the lack of integrated national food policies covering all the stages of the food system.

Another long-term problem is the widening supply gap (food production-population imbalance). This imbalance is increasing the pressure on food supplies and the agricultural natural resource base, which includes fisheries, forestry (and fuelwood), and grazing lands for both livestock and wildlife. Assuming a 2 per cent increase in per capita income and an income elasticity of demand for agricultural produce of 0.7 per cent, and given the current growth rate of population of about 3.2 per cent, efforts to close the gap must aim at not less than 4.6 per cent growth in agricultural production. This is the challenge. The sector is characterised by a circle of poverty which must be broken through substantially improved productivity. Thus as a consequence, the vast majority of the people are ill-fed, ill-clothed, ill-housed and ill-educated. Professor Cairncross has therefore concluded that the LDCs are the slums of the world economy[18].

Because of poverty, many of our countries are involved in *misery-go-round.* Blase says:

> *Low labour productivity results in low wages;*
> *Because wages are low, incomes are low;*
> *Because incomes are low, savings are low;*
> *Because savings are low, investments are low;*
> *Because investments are low, labour productivity is low -*
> *and a full circle has been completed.*[19]

Quite apart from the underdevelopment of basic resources of the subregion (unutilized, under-utilised or misused) including land, labour, water, etc., there is also the question of establishing an institutional framework which is truly development-oriented: institutions and infrastructures which encourage rather than discourage farmers to adopt and implement improved farming practices. For apart from the underdeveloped agricultural sector, the existing secondary (goods industries) and tertiary (transport, commerce) sectors are also underdeveloped and therefore providing no redeeming features to agriculture.

The unsatisfactory macro-economic performance of the African economies reflects both internal and external constraints, and due to structural rigidities. Structural problems and the adverse impact of exogenous constraints to which African economies are highly sensitive continue to severely impede development efforts. The continuing high levels of protection of the agricultural sector in many developed countries is a major obstacle to progress. The high level of protection is illustrated by the Organisation for Economic Co-operation and

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requires an understanding of the political economy of food prices and tools for managing a country's border price.

[18] A. K. Cairncross, Factors in Economic Development, p. 15.

[19] J. G. Blase, 1971. Role of Institutions in Agricultural Development in *Institutions in Agricultural Development*, Iowa State University, p. 9.

Development's (OECD) recent estimate that total transfers from consumers and taxpayers associated with agricultural policies (subsidies) in the OECD countries reached a record level of $ 320.7 billion in 1991, the highest since the OECD started keeping such accounts in 1987.

CONCLUSIONS

Too many indicators of social and economic progress in Africa tell a disappointing story. But economic failure is not a fatality in Africa. Africa's road to salvation does exist, only it is narrow and hard. Socio-economic liberation will not come easily or without a determined start. Fortunately, Africa has natural resources and its people, the professionals who are ready to modernise the continent and the countless smallholders, foresters and fisherfolk who are the main protagonists of development. Governments must understand that agriculture is the only possible springboard for progress and act accordingly, which means implementing the options that give agricultural sector priority in policy and budgetary matters.

Based on our experiences, the first prerequisite for success is political commitment, including a continued commitment to democratising Africa's political systems. The challenge facing Africa is exceptional. The cost of failure would be appalling. An immense effort will be needed to involve the whole population in this commitment: people's empowerment and the principle of accountability in all fields, especially those that have engendered the African crisis.[20] The participation of the people in the recovery and development process should be broadened and made more effective, particularly through promoting increased access to development resources and benefits, creating favourable conditions for decentralised decision-making and encouraging greater entrepreneurship at all levels. Particular attention should be given to domestic economic management, effective mobilisation and utilisation of resources, including human. Special attention also needs to continue to be given to rationalisation of public investment policies, protection of the environment, improvement of international competitiveness, agrarian structures and diversification of production, and improvement of policy design and implementation in general with a view to meeting the food security challenges of the 1990s.

The donor-induced fragmentation of agricultural research has had deleterious effect on food policy data (area, yields, prices) e.g. although donor projects usually include provision for data collection, the reason for the exercise is never well articulated. The result is also fragmentation of national capacity and lack of effort to build national capacities. With regard to food policy analysis, nearly all the countries have people concerned with the problem of hunger and poverty. But in many countries, they don't form a critical mass or have sufficient access to political power to have an influence on policy. Effective policy analysis requires a critical minimum-sized group to work on complex issues. Teams of external advisers, though might assist, can be of little help.

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[20] Numerous studies show that differences in economic growth originate from differences in savings ratios and investment efficiency. The Asian NICs achieved substantially higher savings rates and greater investment efficiency than their counterparts in Africa and elsewhere due, among others, to positive real interest rates. The East Asian economies have also been trade and investment driven while their African counterparts have been aid and debt driven.

Africa's development partners continue to apply pressure on countries for policy dialogue, hence the urgent need for African countries to be more knowledgeable in the field of policy analysis. In order to generate this capacity, food policy research is greatly needed. Good policy research today is the basis for improved policy tomorrow and thereafter. Like farming systems research, changing technology accelerates the demands on policy research by constantly changing the data and relationships on which policy is based. There is clearly an urgent need for improving the government policy planning capacities and to reverse the food crisis through policy analysis training. Countries cannot afford mismanagement, waste and inefficiencies brought about by bad policies. With political commitment, good analysis and careful implementation, food policy offers African countries an important vehicle for reconciling short-term equity with long-term growth and efficiency.

Alleviation of poverty should be a major function of the economy. Development programmes for Africa must be designed to eliminate poverty and the scourge of hunger. Development strategies already in place address this issue, but are yet to be fully implemented. To do so, Africans must not only make an effort, but also a sacrifice if need be. In this connection, the causes of hunger must be clearly understood; and the connections between these causes and the food system ought to be a starting point for the analysis and the design of programmes and policies that meet government objectives as contained in national food policies. Efforts will therefore be required to mitigate the adverse socio-economic effects of orthodox adjustment measures and to ensure that short-term actions are compatible with, and lead to medium- and long-term structural transformation.

An assessment undertaken in 1991 in Kenya, Tanzania and Zimbabwe with the support of the United States Department of Agriculture and the Agency for International Development pointed to both convergence and conflicts between food-strategy and structural-adjustment goals and confirm the tendency of current macro-economic reforms to negatively affect the food consumption of the poor.[21] The economic policies imposed on debtors have, rather than curing the ills, caused untold human suffering and widespread environmental destruction, emptying debtor countries of their resources and rendering them increasingly less able to service their debts, let alone invest in economic and human recovery.

The need for a balanced approach in the use of natural resources must therefore, also be stressed. The ecosystem which underpins the economies of our countries is being seriously degraded, including loss of soil, grazing lands, and dried-up lakes and streams. In Tanzania and Sudan, the tree is being depleted twice its sustainable level. Available statistics indicate that 91 per cent of total energy used in Tanzania was from fuelwood, meaning the burning up of 40 million cubic metres of wood. But the capacity of natural forests was only 19.5 million cubic metres. Elsewhere in the subregion, things are not better. There is the tragic case of Ethiopia. It is estimated that 50 years ago, some 60 per cent of the land in that country was covered with forests, but today only 3-5 per cent is forest. The depletion rate in Kenya is five times the sustainable level, as a result less than 3 per cent of its land is under forest cover. In West Africa, the coastal forest is disappearing by 5 per cent per annum. Reversal is therefore absolutely essential for socio-economic survival.

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[21] UN WFC, Progress Report by the Executive Director on the Work of the Council, WFC/1992/3, 1992, p. 8.

We consider that the twin objectives of protecting the environment and improving the living standards of the rural poor are compatible as long as we have an in-depth look at the economic, human, and technological prerequisites for sustainable development in a constant and comprehensive manner. And recognising that the gap between developed and developing countries is accounted for by technology more than anything else, research effort in this direction must emphasise science and technology for food self-sufficiency. The objective of food self-sufficiency must be realised if we want to solve, among others, the external debt problem. African industry should be based on agriculture and local consumption, e.g. agricultural machinery, processing, transportation equipment, etc. If there is no progress in agriculture, Africa's largest sector, there will be no progress in Africa.

In all the above issues, Africa must do all it can to establish a solid common ground and co-operation, as individually the countries are too weak either in population or purchasing power. Interdependence is a sign of maturity and co-operation is essential for survival. An African common market, for example, will reinforce the region's position in trade negotiations with the rest of the world. Hence, there is a need also for policy and planning to be undertaken at the subregional level (ECOWAS, PTA, ECCASS, SADC, etc.). The institutional framework should be strengthened by having a strong core of planners and analysts working closely with the national planning and programming structures. Efforts at the subregional level should aim at identifying areas that are amenable to co-ordination among countries, e.g. food self-sufficiency, research, agricultural policies and technology, natural resources development and management, trade and so on. The aim would be to minimise distortions and failures caused by lack of economic policy co-ordination across national boundaries and to maximise the efficiency of investment and production through increased trade and the relatively free flow of the factors of production, e.g. capital and labour across national boundaries. Indeed, regional co-operation must become an integral part of national policy making and planning process. One still sees the current economic groupings as falling short of the real needs of the African people.

Hunger is evil, and it is worse when hunger and loss of hope or faith to take action go together. Opening up new horizons in objectives and needed action will be required for those who have lost them; and this will call for inter-country co-operation among the African countries which must identify their resources and priorities to enhance food and agricultural production in the continent. A 5 per cent growth rate is ambitious, but not impossible. To achieve the growth target, all the African countries will need to create an enabling environment, harness new technologies, build and strengthen considerably their own capacities, and safeguard natural resources. Fundamentally, there are three legs to the stool of agricultural progress in Africa: it must be technologically feasible to increase yields to raise output; economically there have to be incentives (economic policies) not just exhortations; and organisationally farmers must be provided with the delivery system - transport and institutions.

The most important impediment to the realisation of the above long-term domestic policy objectives is the danger of succumbing to the temptations of short-term gains and momentary political dividends. Furthermore, none of the above measures will go far, nor will much external aid be forthcoming, unless governance in Africa improves; not to mention the unpalatable reality that in the 1990s Africa will be living in a capital-scarce world economy. Already the aid tap has been turned down to a trickle; and it is not going to be turned on again for a long time.

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ANNEXES: Table 4. Eastern and Southern Africa: Production, Demand and Self-sufficiency in Cereals

(E&SA = East and Southern Africa P = Production D = Food Demand Self sufficiency ratio of cereals = Production of cereals/Cereal food utilised.).

Source: Agrostat data, Food Balance Sheets, Nov. 1993.

	Cereals 1961-69			Cereals 1970-79			Cereals 80-90			Starchy roots 1980-90			Pulses 1980-90		
Country	P	D	P/D	P	D	P/D	P	D	P/D SSR	P	D	P/D	P	D	P/D
Angola	541	380	1.42	503	467	1.08	337	659	0.51	1897	1874	1.01	40	57	0.70
Botswana	33	76	0.43	64	106	0.60	40	170	0.24	7	11	0.64	15	15	1.0
Comoros	11	19	0.58	13	27	0.48	16	43	0.37	54	50	1.08	6	5	1.20
Djibouti	0	13	0	0	23	0	0	46	0	0	2	0	0	1	0
Ethiopia	4146	3646	1.14	4646	4120	1.13	5785	5713	1.01	1831	1667	1.10	743	634	1.17
Kenya	1824	1433	1.27	2519	2026	1.24	2783	2705	1.03	1340	1196	1.12	233	157	1.48
Lesotho	219	186	1.18	202	231	0.87	157	303	0.52	6	10	0.60	6	9	0.67
Madagascar	1411	994	1.42	1657	1259	1.32	1838	1559	1.18	2845	1805	1.58	49	37	1.32
Malawi	1014	700	1.45	1357	959	1.42	1396	1237	1.13	515	404	1.27	235	127	1.85
Mauritius	0	120	0	1	147	0	3	185	0.02	18	18	1.0	1	9	0.11
Mozambique	669	657	1.02	694	765	0.91	644	966	0.67	3981	3848	1.03	81	80	1.0
Namibia	66	87	0.76	78	119	0.66	111	171	0.65	235	180	1.31	6	14	0.43
Seychelles	0	6	0	0	8	0	0	9	0	0	1	0	0	-	-
Somalia	267	288	093	243	318	0.76	487	712	0.68	44	36	1.22	14	14	1.0
S. Africa	7232	3556	2.03	10871	4616	2.36	11635	6289	1.85	1055	752	1.40	106	96	1.10
Swaziland	51	48	1.06	99	72	1.38	120	105	1.14	11	8	1.38	4	3	1.33
Tanzania	1113	916	1.22	1895	1479	1.28	3413	2641	1.29	7653	6438	1.19	387	313	1.24
Uganda	1084	540	2.01	1512	824	1.83	1242	944	1.32	4831	4048	1.19	380	301	1.26
Zambia	893	654	1.37	1298	897	1.45	1238	1339	0.92	244	231	1.06	9	7	1.29
Zimbabwe	1328	806	1.65	2044	1101	1.86	2390	1429	1.67	104	96	1.08	0	37	0
E&SA	21905	15126	1.45	29696	19564	1.52	33635	27225	1.24	12832	22675	0.57	2315	1916	1.21
E&SA - SA	14673	11570	1.27	18825	14948	1.26	22000	20936	1.05	11777	21923	0.54	2209	1820	1.21

Table 5. Food-supply indicators in low-income food-deficit African countries

Country	I	II	III	IV	V	VI
	Daily energy supply(DES) per capita 1 987-89	As % of minimum intake requirements	Changes in DES 1980-89	Index food production/capita, (79-81 = 100) 1987-89	Food production as share of total supply	
					1979-81	1987-89
Ethiopia	1640	70	-0.90	85.1	99.4	87.0
Mozambique	1665	71	-0.82	85.5	64.0	50.4
Angola	1802	77	-2.01	80.1	53.3	46.1
Chad	1809	76	0.08	97.2	86.1	88.6
Sierra Leone	1841	80	-1.50	88.0	74.1	70.3
Comoros	1894	81	0.80	90.4	39.8	26.6
Somalia	1932	84	-0.03	98.8	51.6	70.4
Rwanda	1945	84	-0.39	76.0	93.9	81.4
Namibia	1968	84	0.14	94.7	61.1	61.0
Burundi	1998	86	-0.62	94.7	88.6	92.4
C. African Rep.	2009	89	-0.26	95.1	86.2	66.8
Sudan	2029	86	-1.98	75.4	102.9	85.1
Zambia	2054	89	-0.77	98.4	68.0	101.7
Zaire	2061	93	-0.64	96.6	70.2	67.1
Malawi	2098	90	-0.54	82.8	99.3	92.9
Uganda	2136	92	0.20	92.3	89.1	79.9
Togo	2141	93	-0.08	97.8	83.9	87.8
Kenya	2160	93	-0.39	106.5	79.6	88.8
Madagascar	2181	96	-1.49	90.6	88.4	91.6
Guinea	2193	95	-0.47	87.1	85.4	77.4
Cameroon	2197	95	-0.05	90.0	79.9	63.0
Tanzania	2209	95	-0.30	88.3	96.1	95.4
Mali	2236	95	3.04	98.1	85.7	92.1
Ghana	2246	98	1.63	109.2	78.2	78.9
Benin	2246	98	1.22	118.2	84.5	76.3
Burkina Faso	2286	96	2.64	114.4	91.9	92.8
Niger	2297	98	0.55	80.3	105.5	88.2
Lesotho	2328	102	-0.54	81.0	54.9	42.4
Gambia	2351	99	1.77	91.2	57.0	47.7
Botswana	2370	102	1.32	78.9	23.1	25.2
Senegal	2375	100	-0.14	103.6	62.5	61.6
Liberia	2404	104	-0.01	86.2	63.4	60.2
Guinea-Bissau	2471	107	2.87	101.8	61.7	84.6
Côte-d'Ivoire	2579	112	-0.08	98.0	56.9	55.7
Mauritania	2601	113	2.76	89.2	21.7	39.0
Congo	2603	117	0.66	92.1	16.2	8.1
Swaziland	2612	113	0.53	92.7	61.0	62.9
Cape Verde	2716	116	0.64	124.5	6.7	21.0
Morocco	3007	124	1.37	134.5	60.6	85.9
Egypt	3327	133	0.79	123.2	56.1	54.2

Source: FAO, Agrostat.

Table 6. The situation of abject poverty in developing countries, 1985 and 1991

Region	Situation in 1985[a]		Situation in 1991[b]	
	Number (million)	Share of total abject poverty (percent)	Number (millions)	Share of total abject poverty (percent)
Sub-Saharan Africa	120	19	140	24
East Asia	120	19	69	14
China	80	13	39	9
South Asia	300	48	260	45
India	250	40	205	36
Middle East/N. Africa	40	6	46	8
L. America/Caribbean	50	8	53	9
Developing All	630	100	569	100

[a] The World Bank estimates.

[b] WFC estimates derived from the World Bank data.

Source: The World Bank; WFC.

Table 7. Underweight children in developing countries by region, 1975-1990

Region	Situation in 1980		Situation in 1985		Situation in 1990	
	Number[a]	Percent[b]	Number[a]	Percent[b]	Number[a]	Percent[b]
Sub-Saharan	21.0	29.1	26.1	31.1	30.2	30.8
Near East/N. Africa	5.0	17.2	5.0	15.1	4.8	13.3
South Asia	89.9	63.6	100.0	61.1	101.1	58.6
South-East Asia	23.4	42.8	23.4	40.0	22.4	37.7
China	20.4	23.8	21.1	21.3	23.6	21.0
C. America/Caribbean	3.1	17.7	2.8	15.2	3.0	15.3
South America	4.4	13.2	3.6	10.1	3.0	8.2
Developing All	167.0	38.1	182.0	36.9	188.0	34.8

[a] Millions.

[b] Percentage share of total under-5 child population.

Source: United Nations, ACC/SCN.

Table 8. Changes in mortality of children under the age of five, various periods

Region	Number of deaths (millions)			Mortality rate (deaths per 1,000 live births)		
	1975-80[a]	1980-85[a]	1990[b]	1975-80[a]	1980-85[a]	1990[b]
Sub-Saharan	3.5	3.8	4.2	218	203	170
Near East/N. Africa	1.1	0.9	1.1	159	128	80
C. America/Caribbean	0.4	0.4	0.3	99	87	78
South America	0.7	0.7	0.6	101	89	55
South Asia	6.8	6.2	5 7	203	177	169
South-East Asia	1.6	1.3	1.1	129	111	69
China	1.2	1.1	1.0	58	55	42
Developing All	15.3	14.4	13.9	152	138	108

[a] United Nations, ST/ESA/SER.A/105. [b] Adapted from UNICEF data.

Source: United Nations; United Nations Children's Fund.

Table 9. Progress in reducing child mortality rate, 1980-90, and required progress, 1990-2000, selected African countries (average annual rate)

Negative reduction rate[a/]	Required progress[b/]	Reduction rate < 2%[a/]	Required progress[b/]	Reduction rate < 3%[a/]	Required progress[b/]
Mozambique	14.5	Mali	14.0	Senegal	9.7
Angola	14.3	Sierra Leone	13.0	Madagascar	9.2
		Malawi	12.8	Sudan	9.0
		Guinea	12.2	Central Afr. Rep	8.8
		Burkina Faso	11.8	Togo	7.4
		Ethiopia	11.5	Côte d'Ivoire	6.6
		Niger	11.5	Zaire	6.2
		Chad	11.3	Lesotho	6.1
		Somalia	11.2	Libya	4.7
		Mauritania	11.2	Congo	4.5
		Liberia	10.7	Kenya	4.3
		Rwanda	10.4	Botswana	4.1
		Burundi	10.1		
		Tanzania	8.9		
		Namibia	8.7		
		Nigeria	8.7		
		Gabon	8.5		
		Uganda	8.5		
		Cameroon	7.5		
		Benin	7.4		
		Ghana	6.9		
		Zambia	5.6		

a/ Average annual reduction achieved during 1980-90.

b/ Average annual reduction required between 1990-2000 in order to reach the target of reducing U5 MR below 70 per 1,000 live births set by the 1990 World Summit for Children.

Source: UNICEF

SESSION 2: NATURAL RESOURCE MANAGEMENT AND RESEARCH

Chairman: F. Mwape

Rapporteur: S. L. B. Ishuza

2.1

AGRICULTURAL POLICIES AND SUSTAINABLE USE OF NATURAL RESOURCES IN EASTERN AFRICA

Cameron Short[a] and Kangethe W. Gitu[b]

INTRODUCTION

There are perhaps two general types of questions concerning the complex of policy issues involving natural resources and productive capacity. One question concerns the efficiency and sustainability of resource use, the other whether there will there be enough resources to produce the food and fibre that will be needed for the next generation. These two questions are of course interrelated. If resources are inefficiently managed without due regard to sustainability, then resources are unlikely to be adequate. If resources are insufficient relative to the demands placed upon them, they are more likely to be misused and result in a downward spiral that results from the "mining" of renewable resources.

In the next section, we present some evidence, for Kenya, concerning the first general type of question: is Kenya's overall land base adequate relative to the demands that will be placed upon it for food, wood fuels, grazing and export crops. We review, in the third section, the Machakos Longitudinal Study (MLS) which provides quite a different answer and suggests that smallholder agriculture under very high population densities can result in good management of the natural resources. Conclusions are contained in the final section.

CROSS SECTIONAL ANALYSIS OF LAND USE

Assessing land use patterns is a key to anticipating and managing many resource issues. Unfortunately time series data on land use are not available to enable us to extrapolate land use patterns into the future. This has necessitated the use of mathematical models and other forecasting techniques. King, Higgins, et al for example, use a dynamic simulation model to project Kenya's self sufficiency in basic foods to the year 2020 under a number of alternative scenarios. We follow a relatively simpler analytical approach here, but one, hopefully, with substantial intuitive appeal. We present some data on land use by population density and ask what changes will occur as the rural population increases. (These data have been described earlier in Gitu and Short, 1990). An advantage of this approach is that it clearly illustrates the

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[a] Long Range Planning Project, Office of the Vice President and Ministry of Planning and National Development.

[b] Long Range Planning Project, Office of the Vice President and Ministry of Planning and National Development.

trade-offs involved; how additional land for crop production is likely to impact on land available or grazing and wood. This approach follows directly upon the Boserup hypothesis about the relationship between population density and development.

Our data on land use is derived from low level aerial photographs. The photographs were all taken between 1981 and 1986, so the data are already becoming a bit dated. Each photograph was projected over a randomised dot pattern and land use recorded for each dot. The data are entered into a Geographic Information System (GIS) for each 5 by 5 kilometre grid cell in the study area. The study area covers roughly 53 percent of the high and medium potential land of Kenya and about 11 percent of the low potential. Land use data for each grid cell reflects the distribution of land use of roughly 1400 sample points. Each grid cell has known spatial co-ordinates so data from the photographs can be merged with data from other sources: in this case, population densities by sub-location from the *1979 Census* and agro-ecological zone from the maps prepared by Jaetzold and Schmidt.

We present land use by population density in five major categories. First is the amount of land in roads and housing compounds. Strangely, with all the concern about food security in Kenya and the problem of food imports throughout Africa, the issue of loss of agricultural land to higher valued uses is never mentioned. Population density is greatest where land productivity is highest and most cities and towns are located among the best agricultural land. Most of the land used for housing and roads is likely to be good agricultural land. Second is crop or cultivated land. Crop land comprises the land used for all of the various annual and permanent crops including tree crops, fodder and thatching grass, and fallow. Third is grazing land which includes both managed pastures, traditional grasslands and other non-wooded herbaceous cover. We have divided wooded lands into two subcategories: managed woodland and natural woodland. Managed woodlands consists of plantation forests such as wattle, managed woodlots, and the area encompassed by trees scattered among crops and along paths, hedges, roads and windbreaks. The final land use category is for areas with natural woodland cover.

We have simplified presentation somewhat by combining our data into high, medium and low potential areas. The standard classification of land in the 1970s grouped land into high, medium and low potential based upon average annual rainfall levels. We have not followed the standard definitions but instead defined high, medium and low potential as aggregations of the AEZ's which takes account of factors such as the distribution of rainfall as well as the average rainfall level. Under this definition high potential land is an aggregation of LH1, and UM1-3. This is land with high rainfall capable of growing a wide variety of crops including maize, tea, and/or coffee. Medium potential land is an aggregation of UH1-3, LH2-3, LM1-4, IL1-4 and CL1-4. This land necessarily encompasses a broad ranger of potential cash crops since it includes land from sea level to about 2200 metres in altitude. The distinguishing criteria for inclusion in this class, however, was whether maize is considered a competitive crop in the AEZ. The low potential land is an aggregation of LH4, UM5, LM5, IL5 and CL5. It consists of land where the most competitive cereal crop is either barley, millet or sorghum. In other words, low potential land under this definition, is the arable land within the ASAL regions.

It might be useful here to compare this classification with the standard classification system used in the 1970's. The new classification shows 13.2 percent less high and medium potential land but considerably more low potential land than was thought to be available on the old definition. The old estimate of 5.3 million hectares is increased to 9.5 million hectares.

The net change in total arable land is an increase from 15.9 to 18.7 million hectares (17.6 per cent) although production potential is not proportionately higher.

Population density in Kenya shows considerable variability on all three types of land. We show population density for high and medium land ranging from 0-100 to over 500 persons per km^2 in increments of 100. Population densities in some rural Divisions as high as 841 were recorded in the 1989 Census but the range shown is representative. Densities are much lower on low potential land so we show steps of 12.5 persons per km^2, ranging from 0-12.5 to over 62.5 persons per km^2.

The overall pattern evident in the data on high and medium potential land is very similar: an increase in population density increases the portion of land used for compounds and roads, crops, and managed woodland and reduces the portion used for grazing and in natural woodland. The area used for compounds and roads increases with population density from about 3 to about 12 percent on medium and high potential land. The pattern on low potential land is less consistent but between 2 and 4 per cent of the land is in these higher valued uses.

The proportion of natural woodland declines continuously throughout the range of densities shown. The total proportion of land with a wood cover declines rapidly with population increases at densities below 200 persons per km^2 but seems to stabilise at around 16 per cent at very high densities on both high and medium potential land but continues to decline at the densities shown for low potential land. These results for woodland on high and medium potential land are encouraging in that it indicates the preservation and management of "low valued" resources under very high population pressure. These results are also consistent with earlier findings that woody biomass on small farms increases under very high population pressure in the high and medium potential areas of Kenya.

A main difference in use between high and medium potential land at high population densities is in the relative portions under crops and grazing. This may reflect the response to higher economic returns available to crops on high potential land. Generally, at higher population densities, additional land for crops, roads and compounds appears to come mostly out of grazing land except on low potential land where natural woodland continues to decrease with higher densities and grazing land actually appears to be increasing.

Corresponding average size of holding is shown in the last column of Table 2 under the assumption of an average family size of 5.3 persons. At the highest densities, this amounts to only 0.8 hectares on high potential land and 0.7 on medium potential land with only about half of this cultivated. If this were all in a maize/beans intercrop at representative Kenyan yields, annual production would be around 1400 kg of maize and 125 kg of beans. In other words, production is sufficient for subsistence only. Some farmers with very small holdings in the high potential areas would be able to do better by specialising in high value horticultural crops, tea, coffee or intensive dairy operations. Gross output for these other commodities is 2-4 higher than gross output of the maize beans intercrop enterprise. But these farmers would then be dependent on the market for staple food supplies and the market would have to work efficiently to provide them the confidence needed to follow this strategy.

The share of land cultivated increases fairly rapidly at low population densities but appears to reach a maximum at around 55, 45 and 30 percent on high, medium and low

potential land respectively. It is these maximums which are perhaps the most interesting result of this analysis. They suggest that substantial amounts of grazing and woodland will be maintained at high population densities. They also suggest that less and less additional land will be cultivated in response to increases in the population when population densities increase.

POLICY IMPLICATIONS

Just a few years ago, Kenya was famous for having the fastest population growth rate in the world. The population growth rate, based upon fertility rates reached 3.88 per cent in the late 1970s and early 1980s although the intercensus average rate remained around 3.4 percent[22]. Kenya now appears to be entering the demographic transition phase as the evidence from fertility rates is that the population growth rate is declining rapidly. Even with the expected rapid decline of fertility rates, the rural population in 2010 is expected to be 47 per cent higher the rural population in 1990.

Average densities in the areas covered by our data set are 211 and 127 persons per/km^2 for high and medium potential land, respectively. If we make the perhaps naive assumption that population growth will be roughly proportional, then average population density would result in only about a 9 percent increase in the area cultivated on both high and medium potential land. A similar proportional increase in population on low potential land would increase cropland there by about 14 per cent.

Rural population growth in the past was not evenly distributed. Between 1969 and 1979, most of the fastest growing districts, were those with substantial large farm or settlement areas, reflecting the impact of migration. The pattern for 1979 to 1989 shows a group of rapidly growing districts surrounding Central Province and in the western areas of Rift Valley Province. Some of the areas around Central Province are mostly low potential land while the areas of Rift Province with the highest population growth rates are high or medium potential areas with relatively low densities currently. Thus we might reasonably expect that relaxing the naive assumption might result in more than a 9 - 14 per cent increase in the area cultivated. Even if we double these naive estimates, the increase in area cultivated will clearly be far less than the increase in population. Substantial increases in yields are the only way of maintaining productive capacity[23]. Since only a small portion of increased output can be obtained by increasing the area cultivated, and that would put additional pressure on needed woodland and grazing land, increased production needs to be achieved by increasing yields.

The role of migration in easing pressure on most densely populated land also needs to be emphasised. It is difficult to envisage many more farm people in the areas already at the limits of the population density shown in Table 2. Some accommodation to greater densities might be

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[22] The adjustment for under enumeration for the 1989 Census has still not been published. If the adjustment is the same as that done in 1979, the intecensus rate will be 3.4. Even a substantially higher adjustment only changes the intercensus rate to about 3.5 percent.

[23] Cropland might increase in response to say an increase in the price of crops. At an average population density of 245, only 40 per cent of the land is in lower intensity uses (grazing and natural woodland) compared to 47 per cent for crops so the area cultivated can only physically increase in proportion to population for a short period of time.

made by encouraging more specialisation in the high potential areas and fostering efficient markets for inputs and commodities required to make specialisation work. But migration will continue to be one of the most viable alternatives. Migration from the most densely populated rural areas to both urban areas and the less densely populated rural areas needs to be facilitated.

The basic trade-off is between cropland and grazing land. Programmes are needed to facilitate this change. Taking advantage of more intensive and much more productive confined livestock managing systems will allow more land and relatively more labour to be used in crop production (Gitu and Short, 1990).

The analysis here has implications as well towards such things as the perceived problem of the use of pesticides and fertilisers, their runoff from agricultural lands and/or pollution of groundwater. This may become a problem but we feel that it is not a major problem today. Use of fertiliser in Kenya reached a peak of 285,000 tonnes in 1988/89. Between 1988 and 1992, fertiliser imports declined by 65.4 percent (Central Bureau of Statistics). Assuming about 4.0 - 4.5 million hectares are cultivated in Kenya (Short and Gitu, 1990), this implies fertiliser use averaged 22 - 25 kg /ha in 1992 (though it may have been about three times higher in 1988). This is very low by world standards. Fertiliser use in the Netherlands between 1978 and 1980 average 1122 kg per harvested[24] hectare. The corresponding numbers for Japan, the United States, Egypt, Malaysia, Pakistan, Zambia and Tanzania are 533, 193, 189, 102, 61, 48 and 6 kg per harvested hectare, respectively.

A similar calculation would show relatively low levels of pesticide usage in Kenya. But average fertiliser and pesticide use hide important variability. Use of both pesticides and fertiliser is concentrated on large scale, horticultural, tea and coffee farms which employ modern chemical inputs at levels comparable to the developed countries. The run-off from these may constitute a local problem which requires specific local interventions. The average amount of fertilisers used by smallholders is likely not very different from that used in Tanzania.

Kenya can, like most of the countries listed above, manage the environmental problems that would be caused by using much more fertiliser. What cannot be managed, is the problems that will result from food shortages or the structural distortions implied by a need for food imports when nearly 80 percent of the population is working in the agricultural sector. If we are to avoid this second set of problems, we need to create economic conditions that favour much more intensive use of fertilisers and pesticides; this includes efficient functioning markets for commodities and inputs and varieties that will produce high yields under more intensive management systems.

Finally, it is necessary to consider what impact greater population density is likely to make on the management of the rural resource base. We already have some indication from the above analysis that a minimum amount of land is likely to be maintained as woodland. How well woodland and the land in the other major uses is managed and whether smallholder

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[24] The difference between fertilizer use per harvested hectares and per hectare of cultivated land is that the former corrects for fallowing (which raise the number) and multiple cropping (which lowers the number). Kenya's fertilizer use per harvested hectare would likely therefore be even lower than 21.9 - 24.6 kg /ha.

agriculture in the face of rapid population growth is sustainable without regulatory intervention is addressed in the next section.

MACHAKOS LONGITUDINAL STUDY

Resource use efficiency is an economic concept that relates to the benefits being generated by a particular use in relation to alternative uses for the resource. Efficiency is always difficult to evaluate for long-life assets and especially those which may involve multiple uses, various non-market benefits and possible irreversabilities. Sustainability, therefore, is often a preferred criteria: the concept of sustainability is not peculiar to a particular discipline in the sense that economic efficiency is, and therefore has intuitive multidisciplinary appeal yet encompasses an approach to dealing with some of the most difficult questions concerning the management of resources.

The idea of sustainable development promulgated by the Brundlandt Commission is that our use of the environment and natural resources should not reduce future opportunities: "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". This does not mean that resources should be maintained in completely a natural and pristine condition. Obviously the only way non-renewable resources, such as minerals and crude oil, could be maintained in this way would be not to use them at all. Sustainability could mean, that when a resource is depleted there is some other offsetting investment (perhaps in physical depreciable capital assets or in human capital) but this type of "accounting" has not been attempted so far as we know.

Perhaps because of this difficulty, the idea of sustainability is mostly used in the context of renewable resources. New farming systems may be considered sustainable even though they involve a reduction in forests resources, perhaps even loss of inherent soil fertility and erosion (especially during transitionary phases). Proscriptive intervention is warranted if the new systems being developed will themselves be only temporary. In this context, the sustainability issue applied to new farming systems might be phrased something like the following "Will they lead to natural resource degradation that will reduce future productive capacity?" and "Will the fertility of the soil be irreversibly damaged?". For a long time, the answer was almost presumed to be an emphatic "Yes!" and policy discussion focused on what resources were damaged, how should governments intervene, and what regulations should be promulgated to control smallholder farmers resource management practices.

The Machakos Longitudinal Study (MLS) is a unique evaluation of the interaction between agriculture and the environment. It is unique because it covers a period of 60 years, from 1930 to 1990 when population in the district increased from 238,910 to 1,022,522 and output per person increased by three fold). Conclusions are based, where possible, upon analysis of actual changes in land use, soil loss, soil fertility, natural vegetative cover and tree management that have taken place rather than modelled projections and extrapolations.

Unfortunately we do not have areas such as the Morrow Plots in Illinois and the Rothamstead Experiment Station in the U. K. which provide experimental data on the long term effects of different management systems. Tiffen, Mortimore and Ackello-Ogutu and their colleagues have had to rely on various secondary sources to reconstruct the evolution of land use and the impacts made upon the environment. To do this, they have re-examined aerial and

ground level photographs from the 1930s and 1940s and revisited the areas covered in the earlier publications and attempted to verify conclusions in light of subsequent history. It is not always clear that some of the conclusions made are strongly supported by the evidence presented, however, the longitudinal results do clearly contradict many of the projections of imminent environmental collapse quoted from earlier studies.

Information on land use change is taken directly from aerial photographs taken in 1948, 1961 and 1978. This is supplemented with additional aerial photography and satellite imagery in the 1980s and a review of various field studies which estimated land use. The area of the district intensively studied experienced a major expansion of cultivated land at the expense of bush and grazing land particularly after 1961.

Only a small portion of the area was originally under forest cover but this area decreased initially and later recovered. Another interesting result is that the proportion of the cultivated area that was terraced was around 50 per cent in 1948 and 1961, but this increased to 96 percent in 1978 after the large increase in the area cultivated. This has been an important measure for controlling erosion.

Soil Loss

The early literature on soil erosion in Machakos District is replete with accounts of horrific levels of erosion attributed to overstocking of grazing land, removal of bush and forest cover, and excessive cultivation. Sixty years ago, shifting cultivation systems were used in Machakos which appeared to the European colonialists to be an unsustainable land use system, involving as it does, the use of land for a short period of time before it is abandoned and another plot cultivated. As Boserup argues, shifting agriculture should really be seen as a long rotation, particularly if the land naturally returns to its original state. But the system may result in permanent land degradation when the fallow period shortens because of population pressure. It seems likely that Machakos in the 1930s was undergoing this transition. This coincided with the much publicised "dust bowl" era in North American when drought resulted in the top soil being blown away in large areas of the prairie. Soil loss and erosion became a national issue in Kenya in the 1930s and Machakos was considered one of the most critical areas.

The MLS analysis and literature review indicates that overall erosion rates have been very high especially on denuded grazing land, land cultivated without conservation practices, and roads but that rate has been much reduced in recent years. The gradual introduction of various erosion control practices on crop land such as terraces, establishment of perennial crops, and contour grass strips have been effective. Farmers now are more aware of the problems caused by erosion in the past and of how to prevent it and they are putting significantly greater effort in soil conservation.

One consequence of increased cultivation has been the increasing confinement of livestock to steeper land which is more prone to erosion. An improvement in the management of grazing lands in recent years is attributed to four factors: the recognition that no new land is available for registration and therefore the need to maintain land owned; the changing role of livestock with the substitution of urban employment and other assets as a form of security; the increased use of confinement feeding systems; and the establishment and respect of individual boundaries for grazing land. The overall picture of soil erosion in the district is one of

considerable improvement of erosion control and certainly not the ecological disaster that was predicted by authors in the 1930s and 40s[25].

Natural Vegetation and Tree Management

The MLS conclusions concerning the management of natural vegetation and grazing is somewhat confusing. One of the greatest concerns in the early work done was on the erosion and loss of fertility due to overgrazing. The MLS study strongly concludes that the grazing problem has largely been controlled through enclosures which allows and encourages effective management of grazing lands. There is also effective documentation of diverse activities on the part of individual farmers to manage and improve grazing land. Not all of this effort appears to be effective however. For instance, the MLS study also documents a decreasing grazing value of natural vegetation because of the marked increase of the woody component of the vegetation which means a lowered capacity of the primary grazing resource" between 1960 and 1990. Reduced use of burning is given as an important cause in the increased "woodbines" of grazing lands[26]. It is also argued that previous indications of overstocking are unsuitable because they compare actual stocking levels with recommended levels for commercial beef ranches which "maximise production per head" rather than levels for an agro-pastoralists which "maximise production on a per area basis". Even though "vegetational change having negative implications for cattle production has occurred" stocking rates are seen as ecologically sustainable because "irreversible grazing-induced land degradation has not yet occurred". Implicitly, great faith is put in only two interview/case studies which are fascinating accounts of efforts to manage grazing land effectively over long periods of time. Clearly more work should be done on this aspect, particularly with a greater socio-economic component.

On the other hand, results for tree management are unequivocal. Earlier projections of a wood crises in Machakos are completely unsupported by subsequent events. Alternative explanations of how the crises may have been averted through a shift to kerosene or imports of wood from other districts have patently not occurred. The thesis that remaining timber resources are being "mined" cannot be supported: no evidence was found to suggest there has been a general degradation of remaining woodland, either in timber volume or tree density. Clearly, estimates of woodfuel consumption on which the crises projections were based were too high[27] and/or sources of woodfuel are much larger and more diverse than previously thought. Smallholders undertake diverse strategies to consciously, manage and improve woodfuel resources sufficient for their needs even at very high population densities when a small proportion of land is preserved as woodland. Finally, it is noted that there have been many different government programmes and NGO interventions at least since the 1930s aimed at

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[25] The MLS analysis did not produce any useful results concerning soil fertility: it is concluded that areas which have been maintained "under natural vegetation with minimal disturbance are still fertile" and that areas "which are under long term continuous cultivation without inputs ... have a low supply of plant nutrients". Clearly more work is needed in this area.

[26] It is not explained why farmers have "mistakenly" stopped using burning to improve grazing lands.

[27] This conclusion is strongly supported by Bess.

making farmers aware of the potential problems of deforestation and promoting various solutions.

Policy Implications

The important result of the MLS is that more intensive smallholder agriculture in a densely populated region of Kenya did appear to maintain sustainable land use practices over fairly a long period of time. Indeed, although there continue to be problem areas, on balance the management of resources seems to be significantly better with more than a million people than it was before 1930 when there was about 200,000 people in the district. This result is made more significant in that the region was noted in 1946 as "one of the worst-eroded in Kenya" and just 17 years ago in 1977 that "at the present consumption rate all of the stock [of wood fuel] could be depleted as early as 1988"[28].

A clear conclusion of the MLS is that wood fuel supplies may not be an important pressing issue for farmers at this time. Farmers appear able, with the support of the various NGO's and government programmes, to take the necessary steps to control erosion and maintain continuous crop production. There is need for continued concern with soil loss but this too is a manageable problem. Farmers, in Machakos at least, are aware of the problems and are investing in terracing and better management of grazing cattle to control this potential problem. Again, this result has been achieved with active support by the various NGO's and government programmes.

Not all questions have been answered. The relative importance of government agencies, NGO's and the interests of the smallholders themselves in this achievement is also unclear. Government has been aware and very concerned with the problems of erosion and deforestation in the region at least from about 1930. Various government departments and NGO's have provided information and service to farmers concerning the following:

- encouraged the construction of terraces, contour plowing, and other techniques which reduce erosion on cultivated land;
- promoted enclosure of grazing land and controlled stocking while eliminating land subject to open access;
- provided seedlings and information on traditional and exotic trees and tree management systems; and
- responded to farmers demands for individual title through a land adjudication programme which included land demarcation, titling and registration.

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[28] The first quote is from J. R. Perberdy, "Machakos District Gazetteer," Machakos district Office, Ministry of Agriculture (1958) and cited in Mortimore (ed.), p. 30. The second quote is from P. Mung'ala and K. Openshaw, "Estimation of Present and Future Demand for woodfuel in Machakos District, Kenya," in C. Barnes, J. Ensminger and P. O'Keefe (eds.) *Wood, Energy and Households: Perspectives on Rural Kenya,* Stockholm/Uppsala: The Beijer Institute/Scandinavian Institute of African Studies (1984) and cited in Mortimore.

This combination has worked although it is not possible to say what components are necessary and which are not. It should hearten the agencies concerned to know that their efforts have contributed to the avoidance of environmental disasters projected by earlier analysts.

More work needs to be done especially on soil fertility and pasture systems. It is necessary to replicate and extend various aspects of the MLS study to other areas to provide confirmation of the main results. Although the past provides an indication that smallholders have been able to manage resources effectively and to improve their management, there are no guarantees that they will be able to continue this record in future under still greater population pressure and increasingly smaller and more marginal farm sizes.

The pressure on resources is due to increases in population and incomes. Economic growth in Kenya and other Eastern Africa countries have mainly been a result of the increase in population. Kenya now appears to have exhausted many of the opportunities for this type of growth in future. Future growth will largely be dependent on using natural resources more intensively and increasing yields. On-going monitoring of resource use and analysis will be needed to evaluate the effects of pressure on resources of still higher average population densities which we will certainly see and, hopefully, the effects caused by more intensive production systems which generate significantly higher yields.

Machakos District contains substantial quantities of medium and high potential land although 48 percent of the district is low potential arable land and 19 percent is suitable only for ranching. It is not clear whether the MLS results are applicable to all parts of the district or are differentiable according to land potential. There is need for similar work in the arid areas that are suitable only for livestock production. The group ranching system that was introduced to provide a sustainable resource management system in these areas is regarded as a failure (Munei, 1990) while a recent survey of major resource issues in Kenya concluded that this will continue to be a major problem area. The problem is exacerbated precisely by the trends we note in the expansion of the area cultivated into the low potential areas which formally provided important grazing for livestock from the arid areas. With out the commensurate dry season grazing, the carrying capacity of the arid lands is considerably reduced. We do not believe that the MLS work, valuable as it is, deals with these problems in a substantive way.

SUMMARY AND CONCLUSIONS

Kenya at one time regularly produced an exportable surplus of maize while controlling domestic prices at below export parity. Domestic demands in the past have been driven partially by an increase in incomes but mainly due to an increase in population. Demand in future will continue to increase because of population growth even though the population growth rates are decreasing. More rapid growth in incomes will also be an important cause of increased demands if the structural reform programmes are effective.

Yields of course are variable and even when Kenya regularly exported maize, imports were occasionally needed in exceptionally dry years. Lack of self-sufficiency appeared as an increasing frequency of the need to import and reduced exports in good years. As the surplus disappeared, government responded first by increasing producer prices while farmers appeared to respond well eliminating the need for imports. During this period Kenya was able to respond to the increased domestic demand by reducing exports and increasing the area cultivated.

In 1988, Kenya formally adopted an import parity pricing policy. This implicitly accepts that Kenya could no longer normally be expected to generate any export surplus (when efficiency prices would be set much lower at export parity). Even at import parity prices, production has fallen below demand in recent years and there has been a need for substantial imports. The recent decontrol of prices and marketing will not affect this basic problem except by the increase in market efficiency expected which lower marketing margins.

Our analysis of population density and land use indicates that this source of increased production capacity was greatly diminished by the 1980s contributing to the current lack of self-sufficiency in Kenya. The scope for growth at the extensive margin had diminished and resource based "limits to growth" have made necessary to expand production by increasing yields.

A number of papers have expressed the Government's policy objective to increase agricultural output through expanding production at the intensive margin (Government of Kenya, 1986, 1993). Kenyan maize yields increased substantially in the 1960s and 70s when hybrid maize was introduced but there is little evidence of increasing yields in recent years.

Lack of success may have important implications for resource use. Those near subsistence have little capacity for managing resources effectively: land use decisions are done with survival only in mind may result in the "mining" natural capital without creation of alternative (physical or human) capital[29]. The very poor have low marginal utility for environmental amenities. The only solution to this kind of environmental degradation is income growth. At higher incomes, private well-being and environmental protection can coincide. Environmental amenities (clean air, clean water, natural surroundings, open spaces, ecological tourism) are income-elastic services, desired by those with rising and higher incomes. The process, though, is not inevitable: income is a necessary though not a sufficient condition for sustainable resource use. Governments must continue to monitor resource use to be sure that the private incentives are in place or if necessary a proper regulatory environment.

The MLS shows that record of resource management by smallholders so far has far exceeded expectations over the period 1930-90 in one district of Kenya. Machakos District had very serious erosion problems at the start of this period. Though isolated problems remain, soil loss is now being controlled and sustainable farming systems have evolved. These systems appear to maintain woodlots and other sources of woody biomass sufficient for local woodfuel requirements. The issue of resource management will need further study, however, especially regarding soil fertility, the management of grazing lands and their interaction with crops, and to verify if similar development has occurred elsewhere. There will also be a need to monitor how still higher population densities and the pressure to raise yields affects resource management in future.

The substance of this paper has entirely dealt with Kenya rather than "Eastern Africa". This is mostly because we are very familiar with the problems in Kenya but also because the literature on resource issues tends to deal either with problems at the national level or at the global or continental level. Yet the countries in this region undoubtedly share many of the same

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[29] Mike Roemer suggested many of the ideas expressed in this paragraph although not in the context of this paper.

problems and are perhaps evaluating many of the same solutions. It is hoped therefore, that analysts from other countries will find the material presented a useful "case study" which points to similar or analogous conclusions. It may be, with the high population densities now seen in Kenya, that some of the developments described here will be relevant to neighbouring countries in the near future.

There is, however, a clear need for much more regional co-operation on resource management. There are resource issues where co-operation is absolutely necessary such as the problem of over fishing of Lake Victoria [Southey, forthcoming]. The annual catch has increased by four fold between 1981 and 1990 and is now much higher than the estimate of stocks[30]. The co-operation of Kenya, Tanzania and Uganda may be required to prevent serious over fishing and a resultant collapse. There are other issues where resources can be managed more effectively only through increased co-operation of the countries concerned. Because of the migration of wildlife, game parks appear to be an obvious area where increased co-operation will be needed to one day decide upon and manage population levels particularly as these levels have important implications for farming in the areas adjacent to the game parks. It may be that co-operation in the management of the arid areas may enable better use of available grazing resources. Finally, increased co-operation on food and forest policy may allow increased specialisation and higher incomes that facilitate better resource management.

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[30] The Kenyan catch is 8 - 13 times the estimate of the biomass in Kenyan waters and 50 - 80 percent of the biomass in the entire lake at Kenyan densities. Estimates of the biomass must be erroneous, otherwise the fishery would have long since collapsed but the rapid increase in catch appears unsustainable.

2.2

ECONOMIC INCENTIVES AND CONSTRAINTS IN SOIL CONSERVATION IN MALAWI: IMPLICATION FOR HOUSEHOLD FOOD SECURITY

Julius H. Mangisoni[a]

ABSTRACT

Land degradation is a major threat to production and food security in most parts of Malawi, especially the southern Region. This is apparent in the form of soil erosion, decline in soil fertility, and decreasing yields. Malawi has some of the highest erosion rates in sub-Saharan Africa estimated to be as high as 50 tonnes/ha/year depending on slope and cultural practices. It is estimated that land degradation results in a decline of crop yields of 4% to 11% annually, which translates into an economic loss of 0.5% to 1.5% of GDP (MK18 Million to MK52 Million).

Erosion and the resulting yield losses can be prevented through adoption of proper land husbandry practices such as box ridging, reforestation and agroforestry. However, very few smallholder farmers in Malawi have adopted soil conservation measures. This is despite a 25 year effort by the Land Husbandry Branch, through extension and direct investment, to persuade farmers to adopt such practices. In this paper an attempt is made to identify the factors that reduce farmer's propensity to conserve soil. It is recognised that the past efforts failed to appreciate that farmers combine many factors into a complex socio-economic system, the totality of which needs to be considered when making decisions. Possible factors in the system are labour, land and credit constraints for soil conservation. The paper provides some policy guidelines for enhancing the adoption of soil conservation.

INTRODUCTION

In Malawi over 85% of the population resides in rural areas and derives its livelihood from agriculture. Smallholder families farm 80% of the cultivable land, typically on small plots (less than 3 hectares) and primarily for household subsistence (Malawi Government, 1992). One of the major policy objectives of the Malawi Government is to maintain self-sufficiency in food through proper utilisation of land. However per capita food production continues to fall due to a combination of rapid population growth and decreasing yields (Malawi Government, 1993). If food security is to be maintained for Malawi's 1.8 million smallholder families (comprising about 8.5 million people), the decline in yields must be reversed so that agricultural production can keep pace with population growth.

In the smallholder sub sector, the dominant crop and food source is maize, which currently yield about 800 kg/ha when rainfall is sufficient. It is estimated that the average household (2 adults and 3 children) requires about 945 kg/year to meet minimum nutritional. With an average holding size of 1.0 ha, these needs are barely met and leave little room for years with poor harvests. Moreover, due to increasing land constraints, approximately 55% of smallholders farm less than 1.0 ha (Malawi Government, 1993). As a result, about 50% of the rural

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households deplete their foodstocks by December (4 months before the next harvest). This hungry period results in widespread malnutrition, especially among children under age five (Ng'ong'ola, 1993). For food security to be a reality for all Malawian families, agricultural yields must be increased.

This paper will spell out the land husbandry policy in Malawi as well as past and current government initiatives to encourage farmers to adopt soil conservation practices. Later the factors that reduce the propensity to conserve soil will be presented. Finally policy guidelines for enhancing the adoption of soil conservation practices will be presented.

LAND HUSBANDRY POLICY IN MALAWI

The government policy on land husbandry is to promote the long-term sustainable use of the natural resources of Malawi (mainly soil and water) primarily for agricultural purposes through the rational management of these resources. The Land Husbandry Branch of the Ministry of Agriculture provides guidance and creates awareness to farmers on the vulnerability and scarcity of soil and the need to conserve it. This is done through training of extension staff in land husbandry issues such as biological conservation measures including maintenance of good crop cover, agroforesry and contour strip cropping. Physical conservation measures such as contour ridging, terracing and box ridging are also imparted to both extension staff and farmers.

PAST AND PRESENT GOVERNMENT INITIATIVES IN SOIL CONSERVATION[1]

Pre-colonial Period

During the pre-colonial period, soil erosion was not a major threat to the environment because of three major reasons: (1) people were practising shifting cultivation and grazing which allowed land to regenerate, (2) human population was low and so there was no need to extend cultivation in erosion prone marginal areas, and (3) the level of mechanisation did not involve heavy machinery which enhance deterioration of soil structure, an aspect that is worrying in today's agriculture.

Colonial Era

During the colonial period particularly toward the end of the 19th century to about 1963, there were major agricultural activities in Malawi. The coming of Europeans in the late 1890's did much to change the lives of the people. For instance freedom of movement was curtailed and in 1902 some land was set aside as Natural Reserve. This state of affairs led to overgrazing and widespread misuse of land. The settled conditions also enhanced population growth of the natives.

European agriculture was also characterised by capital intensive technologies such as tractors which encourage deterioration of soil structure and thus accelerated erosion on a large

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[1] Based on E.J. Mwendera, A Short History and Annotated Bibliography on Soil and Water Conservation in Malawi SADC Report No. 20, Maseru, Lesotho 1989.

scale. The natives on their part indulged in bush fires, monoculture and continuous overgrazing which conspired to enhance erosion.

To arrest the erosion problem, soil conservation policy was enacted in the 1950's and a variety of schemes such as the Master Farmer Scheme were formed in order to promote good land use practices. Under the Master Farmer Scheme, progressive indigenous farmers were selected by government in order to set examples of soil conservation in their home areas. These farmers were required to own enough land for effective implementation of the recommended soil conservation and land use practices. This scheme was not successful and the government introduced as an alternative, the Smallholder Scheme under which the minimum land holding was reduced. Other parallel schemes that were introduced included the village land Improvement Scheme through which villagers indulged in collective soil conservation and improved land use practices and the mechanical soil conservation unit which was established in 1955 for the planning, designing and construction of physical soil and water conservation structures.

All the three schemes were unsuccessful because of five major reasons. Firstly, the native were forced to live in concentrated groups by the European farmers. This created a fertile environment for enhanced soil erosion. Secondly, the conservation measures were quite alien and thus unacceptable to the natives. Thirdly, the European farmers and their government placed too much emphasis on physical conservation measures which do not solve the problem of soil detachment from raindrop impact. Fourth, the conservation measures were more relevant for estate agriculture than smallholder agriculture. Finally, the Europeans assumed wrongly that there were no conservation measures within the farming systems of the African farmers.

Post-independence period

Malawi got her independence in 1964. Even in the post independence period soil conservation was viewed as an important part of good farming. However, at this time soil conservation needed to be tackled much more carefully. This was so because population pressure on land was increasing thereby forcing some individuals to cultivate on steep slopes. Further more, the colonial policy of forcing farmers to adopt conservation practices and punishing non-adopters was found to be irrelevant and unacceptable in the post-independence period. In a quest to increase exports, estate farming by Malawians was also increasing.

Thus in this period, Malawi continued to emphasise on physical conservation measures particularly on estate farms and research stations. On smallholder farms the largest project ever was the Lilongwe Land Development Programme. This was implemented in 1968 and it involved lavish construction of physical conservation structures on smallholder farms. In the same year, the Land Husbandry Branch previously known as the Land Use section was established in the Ministry of Agriculture and Natural Resources. This was established with a mandate to provide services in land use planning, land capability assessment and construction of soil and water conservation works particularly to estates.

Government also in the post independence period established the Land Husbandry Training centre in Zomba to provide training in soil conservation to officers in the Ministry of Agriculture and now to officers from other SADC member states. Efforts were also made to include certain aspects of soil conservation in the Land Act and there was a shift in emphasis

from physical conservation to agronomic conservation measures. It was also decided that farmers should be persuaded rather than forced to adopt conservation measures. This aspect was further reinforced by the emergence of the National Rural Development Programme in 1978 which had some emphasis on soil conservation on smallholder farms.

Despite efforts on soil conservation by the Land Husbandry Branch most estates particularly tobacco estates did not follow recommended practices and so erosion continued to be a great threat to production. In recognition of this, the Malawi Government in 1989 established the Estate Extension Service Trust with a mandate to assess erosion problems on estates and give advice on best soil management practices. To date government has introduced an integrated approach to soil conservation which focuses on the environmental, social, cultural and economic realities confronting the farmer . Under this approach, any farming system found to be effective in soil erosion control is promoted and included in a conservation scheme for the area. This is on the premise that good land husbandry practices are area specific rather than universal.

To encourage farmers to adopt conservation measures, soil loss is now being translated into yield loss and conservation practices into yield increases. There is also some soil and water research in various parts of Malawi. This research has mostly focused on strip cropping, agroforestry, alley cropping and monitoring of soil and nutrient losses. These research initiatives have however been frustrated by theft, lack of equipment, inadequate financial support, and poor co-ordination.

FACTORS THAT REDUCE PROPENSITY TO CONSERVE SOIL

Land Constraint

Malawi's high rates of soil erosion are caused by a shortage of land, destruction of vegetation cover and a heavy reliance on erosive crops. It is estimated that 55% of the 1.8 million smallholder farm families have average holdings of less than 1.0 ha/family and that 70% of Malawi's population resides in areas of acute land shortage. The shortage of land is a direct product of the rapidly increasing population. As a result, holding sizes are continuously shrinking. Moreover in some districts e.g. Blantyre, Chiradzulu, Mulanje and Thyolo shortage of arable land is forcing smallholder farmers to cultivate marginal land, very steep slopes, and even protected catchments thereby making these areas more prone to erosion. Where land is scarce it is difficult for farmers to give up a ridge in order to grow trees e.g. *Leucaena* even on strips in order to conserve soil. Farmers do not see the wisdom for doing so. In fact farmers have tended to convert contour bands which were imposed on them by the colonialists into ridges in order to grow more maize.

The high rate of deforestation, estimated at 3.5% per annum, leaves many hills devoid of vegetation. This exposes them to erosion and damages unprotected fields below. The bare hills of the Southern and Central Malawi are typical examples of this phenomenon.

In Malawi farmers prefer to grow their own maize than to buy it from the market. As a result, over 70% of the cultivated land in Malawi is grown to maize under monocropping or continuous cultivation. This practice leads to land degradation through decline in soil fertility and loss of both soil structure and texture. Furthermore, maize is a poor cover crop which leaves

soils bare during the first month of the rainy season when rainfall intensities are highest and most likely to cause excessive erosion. Malawi has some of the highest erosion rates in sub Saharan Africa estimated to be as high as 50 tonnes/ha/year.

Labour constraint

The average family in Malawi does not have enough labour to tend their crops during the growing season, let alone take soil conservation measures. For instance alley cropping based on *Leucaena* is a soil conservation measure that is advocated by both research and extension in Malawi. It is said that this farming system also enables farmers to improve soil fertility apart from earning feed for livestock and firewood for their families. Smallholder farmers in Malawi practice monocropping based on maize and with the monomodal rainfall, farmers face critical labour shortage during peak periods such as planting, weeding and fertiliser application. Pruning of hedges grown in companion with field crops often coincide with such critical operations. To date research in Malawi has not come up with technologies that minimise this problem. There is also little adoption of alley cropping because the recommended tree species does not provide good firewood and poles which are critical needs in land scarce districts in Malawi. It appears that recommendation of *Leucaena* was more based on its value in soil fertility improvement than on the aforesaid area specific needs.

Moreover, families with dwindling cash and food supplies during the growing season find it necessary to take "ganyu" labour jobs off their farms, thus neglecting their own fields. This results in another meagre harvest which throws the farmers into a vicious cycle of food insecurity characterised by low or declining productivity on land and increased propensity to take off farm "ganyu" jobs.

Credit constraint

The benefits of fertiliser use are well understood, and some gain in smallholder credit facilities have increased its use. Currently, about 30% of the smallholders use fertiliser principally because credit facilities have been extended to less than 30% of the farming population (Malawi Government, 1993). Fertiliser is the single most expensive input in Malawi mainly due to the country's landlocked nature. It is estimated that 50% of the ex depot fertiliser price in Malawi is accounted for by transportation alone. This coupled with removal of fertiliser subsidies make inorganic fertilisers beyond the economic reach of about 70% of the smallholder farming population in Malawi. This is made worse by the fact that less than 30% of the smallholder farmers can afford inorganic fertilisers because of the ever rising cost of bringing the commodity into the country and depressed grant aid fertiliser from the donor community. (Despite the importance of agriculture to Malawi economy, grant aid fertiliser accounts for about 20% of Malawi's total inorganic fertiliser supply).

Thus in an attempt to meet household food security in the face of land shortage and inadequate credit facilities, most smallholder farmers particularly in the Southern Region resort to extensive methods of production by encroaching into marginal areas where they do not practice any recommended soil conservation practices.

Nevertheless, the application of fertiliser alone cannot prevent yield losses when erosion is severe. Indeed the Planning Division (1988) reported that fertiliser consumption per hectare of

arable land increased from 14.7 kg/ha in 1980/81 to 21.5 kg/ha in 1987/88, while the average yield per hectare for both local and improved varieties decreased. Local maize yield fell from 1119 to 953 kg/ha and hybrid maize yield fell from 2554 to 2313 kg/ha over the same period. Tobacco yields followed similar trends.

Currently, about 16% of the maize grown in the smallholder subsection of hybrid varieties. Hybrid maize varieties are typically three times high yielding than local maize, and thus more widespread adoption of hybrid varieties offers some promise for ensuring food security (Malawi Government, 1993). Some of the socio-economic constraints to hybrid maize adoption are now well understood (the softness of MH12 causes it to be more vulnerable to bugs and less desirable for pounding into flour) and has led to the introduction of improved flint hybrids (MH17 and MH18). As the Planning Division reported above, however, hybrid varieties are not immune to soil erosion.

Thus, proper land husbandry practices will continue to be essential for increased crop yields. This is because land degradation in Malawi is known to result in a 4% to 11% decline in crop yields annually, which translates into an economic loss of 0.5% to 1.5% of GDP (MK 11 million to MK 52 million) (Wiyo, 1993). The World Bank (1991) reported that soil erosion leads to a mean annual loss of income of MK10 to MK29 per hectare. Also significant is the future productivity of the land due to loss of top soil. This decline in yields combined with a high population growth rate (3.7% per year) has serious implications for national and household food security, especially among the majority of smallholders cultivating less than one hectare.

Ignorance

Most farmers in Malawi are not aware of even simple land husbandry practices such as box ridging yet such practices can have profound impact on soil conservation. Stocking (1986) in Zimbabwe found that box-ridging reduced soil loss from 5.0 to 2.3 tonnes/ha/year on small scale farms situated on well drained sands. Similarly, soil losses fell from 37.5 to 1.0 tonnes/ha/year when trash/mulch was used to protect exposed soil.

In agroforestry technologies there are discrepancies among researchers and extension staff on spacing, pruning heights, and leaf manure application. It is only recently that the Agroforestry Commodity Team has released some recommendations on maize/Leucaena alley cropping practice. For example, some staff burry pruning/leaves in furrows while others apply them on the planting stations. This has made it difficult to have a fully fledged extension message on alley farming to recommend to the farmers. In Machinga ADD there is only one known farmer who is practising alley cropping.

There are also poor linkages among the various sectors conducting agroforestry research which include the Agroforestry Commodity Team, Forestry Department, Extension Personnel, the Land Husbandry Branch and farmers. Similarly on the promotion of Acacia albida, there has been little co-ordination between the Agroforestry Commodity Team, the Land Husbandry Branch and the Christian Service Committee, a non-governmental Organisation. This has resulted in the Non Governmental Organisation taking half baked technologies to farmers with disastrous consequences. For instance some NGOs have taken Leucaena to areas with termite problems, acidic soils, altitude over 1300m above sea level and very sandy and severely nutrient deficient soils.

The recent final report of the Ministry of Agriculture's Agricultural Services Project noted that "the extension system has bypassed the majority of smallholders especially those with very smallholdings who constitute the majority of farmers". The report then points to some of the possible constraints that prevent extension efforts from impacting small farmers: "Extension staff need to see that farmers combine many factors into a complex socio-economic system, the totality of which needs to be considered when making decisions" (Malawi Government, 1992).

The benefit of agroforestry, both agriculturally and economically, have been well documented (see Saka, Bunderson, Maghembe, eds., 1990). For instance, Amphlett (1986) found in a Bvumbwe study that erosion rates were significantly lower in forested catchments (0.03 to 0.09 tonnes /ha/year) than in traditionally cultivated land (4.4 to 14.3 tonne/ha./year). Chome (1989) reported from a study in Ntcheu that soil loss under alley cropping was half that of traditional cultivation. A two year study of maize found that yields declined from 815 to 308 kg/ha under traditional cultivation, while yields rose from 2050 to 2700 kg/ha. under alley cropping. Maize yields under an Acacia canopy can be 2 to 3 times higher, with economic gross margins many times higher, even surpassing the returns of a maize plot with fertiliser.

CONCLUSIONS AND RECOMMENDATIONS

Soil erosion is a serious problem in Malawi particularly in the Southern Region. Most farmers are unwilling to undertake soil conservation measures because of land, labour and credit constraints. There is also ignorance on part of both extension workers and farmers as regards value of most of the simple soil conservation measures such as box ridging, mulching and alley cropping.

Government should therefore encourage resource poor communities to indulge in food for work programmes. These programmes should focus on land husbandry practices on their own farms in order to increase crop production.

Since farmers are not interested in technologies that solve one problem, it is recommended that researchers should focus their attention on solving several interrelated problems. For instance, in alley cropping researchers should endeavour to look for species that would help solve the erosion problem as well as the firewood and poles shortage particularly in the Southern Region. This can be achieved by using multipurpose trees in most of the agroforestry practices.

The nature of agroforestry system should also be ones that can easily be adopted by farmers. For example boundary planting of suitable tree species could assist in erosion control as well as in solving the firewood and pole problems. Government should also put more attention to indigenous practices such as stone lining which are already being practised by farmers in places like Blantyre Agricultural Development Division than to exotic soil conservation measures.

Mixed cropping which is already being practised by farmers in Malawi should be encouraged. This will allow farmers to achieve good ground cover to reduce erosion in the early stages of the growing season.

Resource poor farmers are left out of the existing credit structures because they are not credit worthy. If food security is to be a reality then such farmers definitely need outright input grants to enable them break the vicious cycle in which they are entangled. These have small holdings of less than a hectare where without use of inorganic fertilisers they normally produce less than 1,000 kg of maize grain per hectare. This is depleted in about 4 months by an average household of 6 individuals. This therefore forces them to ignore their fields during critical months (December-March) thereby getting into an endless vicious cycle. To date livestock population in Malawi is too small to provide adequate nitrogen through farm yard manure and the Ministry of Agriculture has done very little to encourage farmers to make compost for use on their fields.

Labour is also a serious constraint on smallholder farms. It is therefore paramount that tree species or technologies that are recommended on smallholder farms be those that do not compete with field crops. It is well known in Malawi that tree species such as Acacia albida (msangu) grow symbiotically with field crops and demand little attention from the farmer. Ways of using this tree in erosion control should also be investigated.

Extension personnel have over the years concentrated their effort on crop varieties and on how they can be grown. They have also done more on issuing of inputs to farmers. It is time for extension to focus on soil conservation practices including simple box ridging, contours, buffer strip cropping and vigorous tree planting campaigns especially on steep terrain.

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DEVELOPMENT OF AGRICULTURE IN EASTERN AND SOUTHERN AFRICA: RESEARCH POLICIES AND STRATEGIES

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INTRODUCTION

Eastern and southern Africa (ESA) is a region of considerable diversity and similarity. The most important similarity is the dominance of agriculture and its contribution to national development. In most of ESA countries, agriculture still contributes more than 30% of GDP, is the most important foreign exchange earner, employs the majority of the population and contributes more than 50% of raw materials for industry. This strategic role of agriculture in the economy will remain so for the foreseeable future (Rukuni, 1994).

The main problems facing ESA agricultural sector can simply be described as a lack of agricultural development. The "food production - popuation imbalance" now requires that food supplies grow at four or five per cent per year a rate which most ESA countries are not likely to achieve in the short-term[1]. Few countries in the world have achieved such growth rates for a decade or more. The US and Japan, for instance, only managed an annual compound rate of growth of 1.5 and 1.6 per cent respectively, from 1880 to 1960 (Rukuni, 1994). In the short to medium term therefore, ESA nations have not only to invest in expanding production, but ensure also that the food insecure are provided a safety net. Using a variety of measures, Table 1 shows the state of food insecurity in ESA. Average per capita daily calorie supply in 1986-89 was lower in most ESA countries than in 1965[2].

However, there is a selection of countries where sufficient peace and political stability and an enabling policy environment have allowed for success stories in smallholder agriculture[3]. It has also been demonstrated that civil strife is the single most vicious constraint to agricultural development[4] in ESA given the chronic stagnation of agriculture due to inappropriate policies (Rukuni, 1994).

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[1] Population growth rates are also unlikely to drop significantly in the short-term.

[2] Average per capita daily calorie supply for sub-Saharan Africa was 2027 for 1986-89 down from 2074.

[3] Examples are tea, coffee, maize, dairy and horticulture, as well maize and cotton in Zimbabwe.

Research can provide the basis for a dramatic demonstration of what is achievable, and thereby encouraging development. However, the full potential of research to assist in crop-livestock development will be exploited only if it is properly conceived within the overall agricultural development strategy.

This paper presents some thoughts on research policies and strategies to support the development of agricultural sector in ESA. The focus is on ESA as part of sub-Saharan Africa (SSA) which presents the biggest challenge facing the agricultural research community in the 1990s (Eicher, 1990). Food production has failed to keep pace with population growth and export agriculture (including livestock) has experienced declining market shares. Also a World Bank analysis of 125 livestock and "livestock-component" projects in sub-Saharan Africa found that 71% of them had economic rates of return less than 10% (World Bank, 1985). Another study showed many failures to adopt technologies proposed by such projects (McIntire, et al., 1992).

AGRICULTURAL RESEARCH AND AGRICULTURAL DEVELOPMENT

Agricultural development models

To better understand the relevance of research policies and strategies for the development of agriculture, it is useful to review the available approaches to agricultural development. These include: (1) the frontier model, (2) the conservation model, (3) the diffusion model, (4) the high-payoff input model and (5) the induced innovation model (Ruttan, 1982).

The frontier model is based on the expansion of the area cultivated or grazed. When land resources are available, agricultural output can be expanded by opening new areas of land. In ESA, like in most areas in SSA, the small marginal increases in total agricultural output have mostly been obtained by increasing the area under cultivation or grazing; methods include shifting cultivation or nomadic grazing. However, there are concerns today about the deterioration of the environment (e.g. soil erosion, greenhouse effect) due to excessive land clearing. While the frontier model has been a source of agricultural growth in many areas of developing countries, it is no longer a viable option. For example, any development of the crop-livestock systems in the humid zone must properly balance the potential gains from increases in crop-livestock output against the environmental cost of clearing the forest. Under existing limited land expansion conditions, growth in crop-livestock production requires some degree of intensification, i.e. strategies that permit an increase in output per unit of resource and a reduction in unit costs.

The conservation model involves the introduction and more intensive use of forages and green manure and an increase in the availability and use of animal manure. This husbandry practice permits the intensification of crop-livestock production through the recycling of plant nutrients, in the form of animal manure, to maintain soil fertility. The critical assumption in this development model is that the plant nutrients, the animal manure and the labour force can be supplied by the agricultural sector itself. Although this model characterised European

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[4] Civil wars in Somalia, Mozambique, Ethiopia, Sudan, Angola, Rwanda and Burundi have resulted in considerable decline in agricultural production leading to hunger, malnutrition and in some cases famine.

agriculture during the 18th and 19th centuries, it is still very valid today for ESA. However, its implementation may not be able to close the food-population gap which now requires that food supplies grow at four to five per cent per year in ESA (Rukuni, 1994). There is evidence that irrespective of the extent of interaction, many of the benefits of closer crop-livestock integration are small (McIntire, et al., 1992). The notable benefits in improved soil quality and fertility, and crop yields are limited by the low output response to inputs such as manure, crop residue and animal power.

The diffusion model is based on effective dissemination of existing technical knowledge and a narrowing of the productivity differences among farmers and among regions (e.g. testing and adapting of exotic crop varieties and animal species). In the case of ESA, this approach proved to be of limited usefulness since some technologies appropriate for developed agricultural regions proved not to be transferable without adaptation while other technologies proved to be plainly inappropriate and not adaptable.

Due to the limitations of the above models, the high-payoff input model emerged (Ruttan and Hayami, 1972) in which the key to transforming the traditional agricultural sector into a productive source of economic growth was seen to be investments designed to make modern, high-payoff inputs available in poor countries (Schultz, 1964). Ruttan and Hayami (1972) argue that this model does not explain how resource endowments induce the development of efficient technologies for a particular society nor does it attempt to specify the process by which input/output price relationships induce investments in research in a direction consistent with a nation's particular resource endowment. To overcome this inadequacy they developed the induced innovation model.

The theory of induced innovation advances the hypothesis that the trend of technological change, including supporting research and development (R & D) tends to be heavily influenced by relative resource endowments and factor prices. Thus, in societies with a relatively ample supply of labour, but severe land scarcity, R & D will focus on the development of labour-using, land-saving technology. The thrust of the induced innovation model is that in order to achieve the productivity level attained by the developed world, it is necessary to invest in the agricultural research capacity required to develop technologies that are appropriate for low productivity countries (Ruttan, 1982). Clearly this implies that the institutional capacity to generate technical changes adapted to local resources must be in place and there must be a heavy emphasis on a science-based system of agriculture (Spencer, 1986). Furthermore, it assumes that a conducive policy environment exists so that the correct market signals will induce appropriate technology generation to achieve efficient development.

The role of agricultural research in agricultural development

How then does research affect agricultural and, more specifically, livestock development? According to Pinstrup-Andersen (1982) the purpose of research is to result in new knowledge and new materials. The knowledge and materials may be the basis for further research or used directly by the agricultural sector. Too many agricultural research projects only result in further research. However, successful research can eventually lead to new crop and/or crop-livestock-related technology.

Modern technology may influence agricultural production by increasing efficiency, i.e. greater production for a given quantity of resources, or unchanged production with a reduction in resource use. In the case of cattle, examples are increased milk yield per cow or increased beef offtake per head of inventory. In addition, the application of modern or improved technology may result in the more efficient utilisation of natural and other resources. Livestock related technologies may also contribute to a change in product characteristics (e.g. milk preservation qualities) and help reduce production risk. These changes affect the quantity of livestock commodities produced (for the market and/or home consumption) and inputs demanded, or both. Greater production per unit of input leads to higher total income for producers and/or consumers. Additional income implies further increases in earnings, consumption, production and investment in other sectors.

The various types of research institutions carry out different types of research: basic/strategic, applied and adaptive research. These types of research form a continuum in the research spectrum and all have implications for development. Basic/strategic research is scientific investigation that advances the knowledge of feasible biological processes. In agriculture, it may not have immediate application in farming practices. In basic or strategic research, the definition of the problem is more general, the degree of the predictability of results is moderate and the extent and time of impact is broad and long. Applied research is oriented towards achieving a practical objective, such as developing the genetic resistance of crops and animals to insects and parasites. Adaptive research refers to adjustment of technology to a particular set of farming conditions. An example is the selection of certain forage species or a crop variety to fit a specific agro-ecological zone or region. Contrary to basic or strategic research, the definition of the problem in adaptive research is very specific, the predictability of results is very high and the extent and time of impact are narrow and short.

National agricultural research systems have comparative advantage in adaptive research and applied research. The comparative advantage of regional institutions lies in applied and adaptive research while international centres and advanced institutes have a comparative advantage in basic/strategic research and applied research.

POLICIES AFFECTING AGRICULTURAL RESEARCH AND DEVELOPMENT IN ESA

Research policies and strategies of ESA countries

Lack of productive agricultural research is a main characteristic of post-colonial ESA. This problem can be examined by reviewing some of the operational difficulties that national research systems have encountered, as well as the role of public policies.

Investment in agricultural research capacity

Three determining factors are discussed: research infrastructure, human capacity and operating budget. A skeletal agricultural research infrastructure was established in most countries in ESA in the first two decades of this century. Between 1900 and 1920, at least one agricultural research station was established in virtually every country in SSA (Mckelvey, 1965). These research stations, however, concentrated almost exclusively on export crops such as oil palm, cocoa, coffee, groundnuts, cotton and yielded rather substantial returns. Colonial

approaches to development facilitated the production and extraction of surpluses for external markets while paying little attention to investments in research on food crops.

Hybrid maize in Kenya and Zimbabwe was the only staple food to which substantial research efforts were directed during the colonial period. After independence, however, the institutional base of agriculture was largely geared to supporting large farms, plantations, ranches and export agriculture (Eicher, 1990).

Africa's scientific and institutional gap is in part the result of a century of colonial under-investment in developing Africa's scientific and managerial capacity (Eicher, 1990). Today after three decades of independence, Africa has the lowest level of scientific capacity in the world. Africa has one- fifth the number of R & D scientists and engineers per million people that Asia has. Moreover, about a quarter of the total value of agricultural resources in National Agricultural Research Systems (NARS), including academic staff, are expatriates (Eicher, 1990).

In order to function effectively NARS need not only trained personnel, but also adequate funds to cover fixed and operating costs. Unfortunately, the resources available to NARS are rarely utilised effectively or efficiently. Too often resources are only available for maintenance of staff and infrastructure; ESA governments like in the rest of Africa usually accord a very low priority to agricultural research. For instance, despite the success of maize research programmes in both Kenya and Zimbabwe, these programmes suffered severe set backs in the 1980s, with operational budgets plummeting in both cases (Eicher, 1994; Rukuni, 1994). Eponou (1993) reports that for the less developed countries including SSA, the average expenditure on agricultural research for the 1981-85 period was 0.94% of agricultural GDP. Salaries often account for 90% of the total budget leaving little for operational expenses. But there are many difficulties associated with budgetary deficiencies, including inadequate emoluments to retain high-quality staff, delays in release of funds to pay salaries on time, and a frequent virtual absence of funds for operational expenses associated with research activities (Lipton, 1988). External donor funding is thus used most often for the marginal costs of experimentation. As a result many NARS are performing poorly and are heavily dependent upon foreign aid.

The ability to carry out agricultural research is central to solving the problem of providing sustained growth in labour and land productivity in ESA. Therefore, the human capability/institution-building model of development should replace the long-term technical assistance. However, the necessary institutional and technological development will not take place in a research environment increasingly dominated by short-term production in project related work as has been the case in Africa. For example, the major successes in maize research in Africa have occurred in maize breeding (Byerlee et al., 1994). However, the maize research programmes in ESA required a decade or more of sustained effort to produce suitable varieties and hybrids that were adopted extensively (Eicher, 1994; Anthony, 1988; Delgado and Mellor, 1984). In countries where research programmes have been unable to ensure continuity of staff and breeding strategies, agricultural research has had less impact (Goldsmith, 1990).

Building effective national research systems capable of doing adaptive as well as applied research addressing major problems encountered by farmers is clearly the first priority for long-term acceleration of agricultural production. Development of the agricultural sector in ESA will

require significant investment in higher education. Stake holders in the research process (farmers, extension agents, agribusiness, policy makers, etc.) are not usually involved in setting national research priorities and developing programmes. Their involvement is essential to ensuring that research will be relevant to national needs. As the experience has shown in Kenya and Zimbabwe, farmers need to organise themselves in order to have a political voice to influence research agenda (Eicher, 1994 and Rukuni, 1994).

Role of public policies

The policy environment generally has direct bearing on the demand for technological change and the extent and impact of the change. Sound economic policies in support of agriculture can have several critical effects. They can favour investment in infrastructure; improve proper incentives to farming; facilitate adequate and timely supplies of production inputs and the delivery of animal health services; improve effective marketing and credit facilities; and encourage increased crop-livestock productivity through biological research (Fitzhugh, et al., 1992).

Policy factors greatly influence the efficiency of food production and distribution and consumption. Trade policies that encourage imports of cheap dairy products, for example, have discouraged the development of domestic dairy industries in many parts of Africa (Von Massow, 1989). Government policies that depress domestic production and encourage poor management of the natural resource base include food pricing policies that subsidise consumers and tax producers, over-valued exchange rates that favour imports rather than domestic production and inefficient input and credit market policies that inhibit the uptake of new technologies (Ehui, 1993; Ehui et al., 1994). For example, analysis of the effects of policies on peri-urban dairying in and around Nairobi, Kenya, indicates that despite recent price decontrol in May 1992, the market remains non-competitive and the effect on producers negative compared with potential profitability in a policy-free environment. The study revealed that peri-urban dairy producers have important opportunity for higher profits due to the policy reform since market access is good and productive technology can be profitably used (Staal and Shapiro, 1993).

A major constraint on technology adoption in ESA is the unavailability or late arrival of inputs (Byerlee et al. 1994). For example, one study of farmers' reasons for not following the extension recommendations developed through adaptive on-farm research in Zambia found that in 44% of the cases, inputs simply were not available (Low and Waddington, 1991). In some cases, distortions in producer prices are the major factor limiting technology adoption. In Ethiopia, fertiliser use in maize was uneconomical at any level under prevailing prices for maize, but if maize prices were to reflect import prices at realistic exchange rate, fertiliser would become an attractive investment (Legesse Dadi, et al., 1990).

However, there still exists scope for improving price incentives in ESA countries if macro economic imbalances that cause exchange rate distortions and high domestic inflation can be corrected for.

One example of where improved policies have had an effect on land use practices and sustainable management of natural resources is the Machakos District in Kenya. In this area, in the 1930s, there was considerable erosion and pasture degradation. British colonial

administration statistics also showed low crop yields. Recent (English, et al., 1994) studies show that despite a fivefold increase in population, there were more trees, less erosion, and higher agricultural output. Farmers have invested in terracing, tree planting, and sustainable agricultural intensification. Several factors contributed to this situation. Kenya's agricultural policy environment was favourable. Therefore farmers' incentives to invest in agricultural intensification were high. Integrated crop-livestock systems were introduced. This was facilitated by excellent infrastructure invested in by government and intensive research and extension dated from the 1940s. Also output markets grew rapidly and were easily reached from Machakos. Early introduction of soil conserving technology, good public investment in education and health services, and secure land tenure regimes contributed to the successful management of agricultural lands in Machakos.

Policy research is therefore necessary. It must first improve the available data base and provide analyses to help policy makers anticipate and understand the probable consequences of their actions. Policy research is even more needed because as a result of current structural adjustment programmes, new policy instruments (e.g. full cost pricing for services, full payment of market prices and market interest rates) are being introduced in many countries. There is a critical need to know how these new policies can facilitate or hamper development and integration of crop and livestock systems and sustainable use of the natural resource base.

RESEARCH POLICIES AND STRATEGIES OF DONOR COUNTRIES

International concerns affect donors' attitudes toward agricultural development in ESA. These include issues related to the environment, resource allocation to crop or livestock sectors, equity issues, existing food surpluses in the developed world, and the debate about the role of private versus public sector in agricultural development.

Environmental issues

The causes of deforestation have become an issue in the developed world. Global losses of tropical rain forest are a cause for major concern and global deforestation has been recently associated with increased production of greenhouse gases and global warming. Another global concern is desertification. Too often and mistakenly, the development of animal agriculture is seen as harmful to the environment yet research results do not support this thesis. For example, studies by the International Livestock Centre for Africa (ILCA) on the dynamics of rangelands in the Sahel show that livestock are not the major factor in the rangeland degradation. Pastures in arid lands are dominated by annual species of grasses that are relatively unaffected by grazing pressure. The state of pasture is much more dependent upon episodic events than the stocking rates (ILCA 1991). In a recent review of literature on the impact of livestock on rangelands, Dood (1991) concluded that the effect of grazing and drought had been confused and that there was no solid evidence of irreversible effects on vegetation from livestock other than around water points and permanent human settlements. In the humid and sub-humid zones, the major impetus for expansion of agricultural land is population growth combined with shifting cultivation practices (NRC 1993).

However, we must take into account the hypothesis by Anderson (1992): "The (yet) uncertain rates of degradation of African agricultural environments are probably greater than is described from the points of view of both African national governments and international

development agencies, and considerably greater than is deemed acceptable to informed agriculturalists".

Livestock versus Crop

Another factor contributing to the bias against livestock development in SSA is the belief that public investment in crop research generates greater benefits to society (especially poor countries) than that invested in livestock research. The proposed rationale is that increased demand for livestock products is only likely to occur after substantial increases in supplies of staple food crops, i.e. cereals, roots and tubers is realised (Mellor and Johnston, 1984). But this argument does not take into account the fact that the demand for livestock products increases more rapidly than food crops as income increases. Thus an extra consumption of these goods will always be preferred on the margin. In deciding where to invest, what matters is the marginal cost versus the marginal benefits of producing livestock products and food crops. This is an empirical question which warrants further investigation. Moreover, in the semi-arid and sub-humid zones of ESA, integrated crop and livestock production is the only significant mechanism by which to ensure long term viability and the sustainability of agricultural production systems. Anderson (1992) observes that the interrelationships between livestock and cropping are multifaceted and are particularly tied to the question of labour availability. In some instances when labour is scarce, livestock tend to be cared for more than crops. Furthermore, the technological opportunities for improving livestock are even more daunting than those for crop improvement.

Surpluses in the developed world

Another factor that negatively influences the development of the livestock sector in ESA is the idea that there are already large surpluses of livestock products in the developed world which could be imported. Although perhaps valid from a strictly financial standpoint, this view does not take into account the fact that by and large these surpluses have been obtained through subsidies and other programme support. If these policies were removed, ESA countries and developing countries in general would have a comparative advantage and could take advantage of their resource endowments. Furthermore, in view of the shortage of foreign exchange in most ESA countries, importing livestock products would be an inefficient use of resources resulting in lower growth in national incomes. The Winrock report (1992) indicates that if livestock production trends in SSA do not improve, meat output will be 65% of the production growth needed, and cow and goat milk will provide only 75% of the required production growth. These imports would cost $16 billion annually. This is without including the contribution of livestock to the household welfare of draft power and manure.

Private versus public sector investment in agricultural development

This debate in the donor countries centres around whether private or the public sector should finance the development of agriculture in developing countries. The origin of this debate lies in concerns for liberalisation and privatisation arising from the process of structural adjustment being undertaken in the developing world. The belief expressed is that in many countries, the economic situation can only improve if the government or public sector disengages from economic activity. This argument neglects, however, the role that a government can play to correct for market failures arising from the existence of public goods

(Smith and Thomson, 1991). One example is the significant role that research can play in economic development. Today there is broad consensus that a significant proportion of agricultural research must be recorded as a public good, requiring funding by the public sector even in countries pursuing free market philosophies (Ellis, 1992).

Furthermore, as stated by Schultz (1990). "The only meaningful approach to modern agricultural research is to conceptualise most of its contribution as public goods. As such they must be paid for on public account, which does not exclude private gifts to be used to produce public goods." Public investment in livestock research furthermore can be a very profitable investment undertaking judging only from the high rates of return to research (greater than 50%) obtained in other parts of the world (TAC, 1993). Karanja (1990) computed an average annual rate of return on investment in hybrid maize in Kenya from 1955 to 1988 and found it to be 68% while Kupfuma (1993) found it to be 39% for Zimbabwe.

The evidence from ESA and elsewhere in Africa (Byerlee, et al., 1994; Tripp, 1993) shows that in the successful transformation of small-scale agriculture, the public sector has played a key role in establishing input markets and providing appropriate price incentives and stability.

RESEARCH POLICIES AND STRATEGIES OF REGIONAL ORGANISATIONS AND NETWORKS

Regional collaboration among NARS concerned with similar problems offers important opportunities to accomplish more with the scarce resources available for research. In ESA, there are several regional organisations addressing agriculture. These are South African Development Community (SADC), Intergovernmental Authority on Drought and Development (IGADD) and the Common Market for Eastern and Southern Africa (COMESA formerly Preferential Trade Area). The Southern African Centre for Co-operation in Agricultural Research (SACCAR) is the research arm of SADC. Hence SACCAR and IGADD are the two regional organisations with mandate for agricultural research.

Regional programmes complement the functions of NARS and International Agricultural Research Centres (IARCs) and serve as a mechanism for NARS to pool resources and to sub-divide responsibilities in the accomplishment of individual and collective objectives. The programmes can be particularly useful in the study of regional problems often manifested on an agro-ecological basis but like NARS they frequently lack sufficient funds.

Networking allows collaborating NARS partners to pool and co-ordinate scientific efforts on a regional basis and address problems of mutual interest more effectively thereby avoiding duplication of effort. Although national scientists are increasingly well trained, there are few in the same discipline in each institute or even in each country. Therefore multilocational regional projects managed through networks offer considerable opportunities for enhancing the efficiency of research. Multilocational projects also allow the introduction of standardised methodologies, leading to more significant conclusions that can be obtained from isolated experiments.

IARCs with a livestock mandate such as the International Livestock Centre for Africa (ILCA) and International Laboratory for Research on Animal Diseases (ILRAD) play major

roles in networks. As partners in collaborative livestock research, they provide training opportunities to network participants, disseminating research methods and results and facilitating the exchange of information. IARCs also assist with network support functions. These include helping to attract donor funding, helping to organise networks (setting up network steering committees), sponsoring meetings of participating scientists, and providing services in areas such as data analysis, documentation and publishing. The success of networks and regional organisations will substantially depend on national policies which encourage their establishment and support through sharing of human, financial, infrastructure and other resources. NARSs, RACs and IARCs have to form new and more effective partnership in ESA, so as to emerge from a collective chronic irrelevance to the smallholder farmer (Rukuni, 1994).

FUTURE RESEARCH NEEDS

The major research needs in ESA on animal agriculture include strategic and applied research on: (1) ruminant production (e.g. enhance nutrition through improved management practices and the development of better pasture, forages, and other feed resources); (2) control of ruminant diseases, particularly tsetse-transmitted trypanosomiasis, which is a major constraint in large parts of SSA, and theileriosis (east coast fever), a major constraint in ESA; (3) genetic improvement (e.g. genetic manipulation at the molecular level, and combination of high yields of "exotic" breeds with well adapted indigenous genetic resources); (4) natural resource management (e.g. long term monitoring studies incorporating geographic information systems, remote sensing and modelling, and identification of ways that livestock, and livestock-related technologies, can best contribute to the sustainable intensification of mixed crop-livestock production systems); and (5) policy research (e.g. examination of government policies and resource management institutions on the sustainability of crop-livestock systems, analysis of the opportunities for and constraints on increased interregional trade in livestock). Crop research will also be concerned with issues of breeding, crop and natural resource management and policy.

The success of this research will depend on the extent to which research addresses farmers' chief problems. Farming system research (FSR) approach can assist in identifying farmers' problems and hence making crop-livestock research relevant. Hence, the investment in the institutional capacity to conduct FSR should be increased and its impact be evaluated over the long term in the same vein with crop-livestock breeding research.

Another area with scope to increase research efficiency is the characterisation of farming systems. The application of new computer technologies in the form of crop models and geographic information systems now allows more precise agro- ecological zoning and the possibility of targeting research more closely to major systems (Byerlee et al. 1994). Initial work in Kenya shows promise in aggregating micro level environments into a few major environments for setting maize research priorities and testing emerging technologies (Hassan et al. 1993). This kind of analysis can potentially be extended to define regional research priorities over countries, a need that is particularly important, in the ESA and Africa at large, given the small size of many countries (Byerlee, et al., 1994).

CONCLUSIONS

The greatest need for crop-livestock research is to improve productivity and therefore food security in ESA. Research can demonstrate what is achievable thereby encouraging economic development. However, in order for research to be effective, it must be properly conceived within the overall development strategy. There is real need to increase investment in crop-livestock research to address farmers' chief problems. National governments, donors, regional and international Organisation each have a role to play. The primary responsibilities for research and development lie within national governments of ESA. However, in order to function effectively national research systems need trained personnel, adequate funds to cover fixed and operating costs.

A major factor in ESA's low productivity is the region's limited scientific and institutional capacity. It is therefore essential that national policies support investment in human capability and institution building. Donors should assist in building the human resource and institutional capacity rather than investing in short-to medium-term development projects, most of which fail. Regional and international organisations are still needed to assist NARSs with the transfer of results from basic, strategic and applied research as well as in training activities. Crop-livestock research and development will not be effective unless there is a full partnership programme between NARSs, RACs and IARCs.

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2.4

THE ECONOMIC IMPACTS OF IMMUNISING CATTLE AGAINST EAST COAST FEVER ON FARMS IN KENYA

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ABSTRACT

A whole farm simulation model termed as the Technology Impact Evaluation System (TIES) was applied for assessing *ex-ante* financial and economic impacts of immunising cattle against East Coast fever (ECF) disease using a new technology referred to as the infection and treatment method (ITM). Data from case study farms from two regions (Kilifi and Uasin districts) of Kenya were used in the analysis. The financial and economic impacts on farms for the current acaricide based ECF control method (BASE) and four ITM based strategies were analysed over a 10-year planning horizon. The means of output variables such as annual cash expenses and receipts, net cash and farm income, net worth, net present value (NPV), internal rate of return (IRR), and benefit cost ratio (BCR) generated by each strategy on farms were compared.

Farmers' risk preference for alternative ECF control strategies was assessed through stochastic dominance analysis. Results showed that ECF control based on ITM strategies were financially and economically more profitable than the current acaricide based control method on all farms. The more ITM allowed for a reduction in the cost of using acaricides, the higher was the level of profitability achieved, other model parameters held constant. ITM combined with a 75-percent reduction in acaricide use (ITM75-NC) was the most economically preferred strategy. The magnitude of change in selected output variables for ITM based strategies over the BASE control method on farms ranged between 23-379 percent for NPV, 20-295 percent for IRR, and 60-250 percent for BCR.

The confidence premiums associated with ITM75-NC strategy over the BASE were Kshs. 1771 and 1750 per animal on the small and large farms respectively in Kilifi District while, the estimates were Kshs. 1580 and 2552 per animal for the small and large farms, respectively in Uasin Gishu District. It is concluded that the results are a good indication of the relative orders of magnitude of the farm level financial and economic effects of ECF control by ITM. Thus, the TIES model used in the analysis could be usefully applied for assessing the economics of ITM in other livestock production systems or any other crop or livestock technologies to select among competing alternatives.

INTRODUCTION

East Coast Fever (ECF), a cattle disease caused by the protozoan *Theileria parva* and transmitted by the tick *Rhipicephalus appendiculatus* is a major cattle disease which limits dairy and beef production in Kenya and ten other countries in eastern, central and southern Africa. Taurine cattle *(Bos taurus)* breeds and crosses of Taurine cattle with the indigenous

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(Bos indicus) breeds commonly referred to as grade cattle in Kenya, and which are more productive than the indigenous breeds are more susceptible to ECF than the indigenous breeds (ILRAD, 1990). Infected animals usually succumb to the disease unless treated early after infection; however, those that recover from infection show substantial losses in milk yield and live weight gain.

The disease is conventionally controlled using acaricides to control tick infestation and by treating the sick animals. Due to the high costs of the acaricides, estimated at Kshs. 40 to 170 per animal per year (Lawrence and McCosker, 1981) and Kshs. 170 to 480 per animal (Nyangito, 1992) and treatment costs, estimated at Kshs 200 to 400 per treatment (Mutugi, et al., 1988 and Young, et al., 1989) and the problems associated with the use of acaricides such as tick resistance, the conventional methods are not effective in controlling the disease. A new technology known as " the infection and treatment method" (ITM) (Radley, 1981) has been developed for immunising cattle against the disease. This immunisation enables the animal to develop an immune response which protects the animal against the disease for its entire life.

ITM has proven to be practically feasible (technically and economically) both on research station and field trials (Morzaria, et al., 1988; Mukhebi, et al., 1989; Mukhebi, et al., 1990; Mukhebi, et al., 1992). However, controlling ECF alone using the new technology may not be adequate because the presence of ticks also causes stress on cattle and can transmit other disease. This means that ITM will have to be used in conjunction with the conventional methods of controlling ticks to control the disease. The study (Nyangito, 1992) reported here focused on the evaluation and prediction of farm level financial and economic impacts of alternative ECF control strategies on smallholder farms in two regions of Kenya. A whole farm simulation model termed the Technology Impact Evaluation System (TIES) (Richardson et al., 1991) was used for the analysis.

METHODS AND PROCEDURES

Description of TIES

TIES is a computerised simulation model which quantifies the economic impacts of alternative technologies on smallholder farms in developing countries. The model incorporates annual crop and livestock enterprise activities, such as production, household consumption and marketing. It consists of accounting equations and identities for simulating the annual production, marketing, financial management, and household consumption aspects of a smallholder farm. Accounting equations are used to calculate crop and livestock production activities which include output sales and on-farm utilisation. Identities are used to calculate crop and livestock receipts and to calculate herd dynamics for death loss and sales.

The model uses one year as its time step and simulates 10 years recursively, by starting each year with summarised information of the farm from the previous year. Exogenous variables influenced by weather and market forces are drawn at random using a pseudo-random number generator built in the model to simulate the uncertainty and risk faced by farmers. Each year in the planning horizon is simulated for 100 iterations to generate estimates of the parameters for key output variables, such as annual cash expenses and receipts, net cash and farm income, net worth, internal rate of return (IRR), benefit cost ratio

(BCR), and net present value (NPV). The values can be averaged for each year to analyse the annual financial and economic impacts or they can be averaged over the ten year planning horizon to analyse the impacts of alternative technologies over the planning horizon.

Evaluating Economic Effects

Evaluation of the financial and economic effects of alternative ECF control strategies using TIES is a two step process. First, the model simulates the BASE farm using farm enterprise data under the current ECF control strategy (weekly dipping with acaricides and treatment using drugs) collected from the farmer and supplemented by secondary data sources. The second step is to simulate the farm with appropriate changes for the new ECF control technology (ITM). This is accomplished by changing the relevant variables in the model that will be affected by different ITM strategies. The affected variables include the cost of ITM delivery, acaricide cost, ECF mortality rates in different cattle age groups and calving rate. Likely changes in the values for the technology-related variables following immunisation are derived from results of previous field trials and from discussions with field experts on the disease (e.g. research scientists, veterinary practitioners and extension agents). In both the BASE and ITM technology simulations, various output variables are generated with associated probability distributions for comparisons.

The financial and economic viability of ITM strategies compared to the BASE control method can be evaluated using absolute mean values of the output variables such as NPV, IRR, and BCR. However, mean values are not robust enough to always rank unequivocally the most preferred alternative while taking into consideration the risk preference of the decision maker. The stochastic dominance with respect to a function (SDWRF) criterion incorporated in the TIES model is therefore used to rank alternative ECF control strategies. SDWRF is a method used to screen out inefficient, risky technology choices (i.e. ECF control strategies) that can be considered by a decision maker.

In this paper, probability distributions for NPV were chosen as the output variable for ranking the alternative ECF strategies. NPV is widely used as the criterion for selecting among alternative investments because it has the advantage of being consistent for all investments when compared to BCR and IRR criteria (Barry, et al., 1988). The probability distributions were ranked under the assumption that farmers are risk averse. The risk aversion coefficient bounds used in the ranking were estimated at 0.00000 to 0.00001 (Nyangito, 1992).

TIES also calculates confidence premiums for the NPV probability density functions across alternative technologies (i.e. ECF control strategies). The confidence premium is an estimated measure of the conviction held by the decision maker for a preferred strategy over the challenger, assuming all other things equal (Mjelde and Cochran, 1988). Confidence premiums can be thought of as shadow prices (marginal values or benefits). The confidence premium in this case reflects the marginal value or benefit to the farmer per additional animal immunised by a given alternative ECF control strategy over the dominated one.

Description of Case Farms

For a detailed analysis of the economics of ECF immunisation by ITM for this paper, four case study farms from two regions in Kenya were chosen. These were the highland Uasin Gishu District and coastal Kilifi District. The farms were selected from a random sample of 18 in Kilifi District and a similar number of farms in Uasin Gishu District that had been surveyed by Nyangito (1992).

The case study farms in each district were classified as small and large. The small farms represented smallholder farms with land size of less than 10 hectares in Kilifi District and less than 20 hectares in Uasin Gishu District. The large farms represented smallholder farms larger than 10 and 20 hectares for Kilifi and Uasin Gishu Districts respectively. The reason for the two farm size categories was to assess whether ECF immunisation would yield significantly different economic effects on relatively small and large farms.

Some of the characteristics for the case study farms are presented in Table 1. The small farm in Uasin Gishu District had about three times more assets than the Kilifi District farm while, the large farm in Uasin Gishu District had seven times more assets than the Kilifi District farm. Cattle contributed proportionately more to the assets value for the farms in Uasin Gishu District than the contribution for the farms in Kilifi District. Grade cattle kept in Uasin Gishu were pure-bred Taurine breeds and grade cattle of a higher pedigree while, the grade cattle kept in Kilifi farms which were of a lower pedigree. Besides cattle, a wide range of crops were grown in the farms in the two areas.

All the farms used acaricides to control tick-borne diseases. The estimated costs of acaricides were Kshs. 480 and Kshs. 274 per animal per year for the small farms in Uasin Gishu and Kilifi District and Kshs. 170 and Kshs. 400 per animal per year for the large farms, in Uasin Gishu and Kilifi districts, respectively. Thus, the highest acaricide costs were for the small farm in Uasin Gishu District and the large farm in Kilifi District. These costs indicate the intensity of use of acaricides.

ECF Control Strategies Analysed

Five alternative strategies for controlling ECF were tested: (a) base farm with current ECF control method (BASE); (b) ITM introduced with no change in acaricide use (ITM); (c) ITM introduced and a 50 percent reduction in acaricide use (ITM50); (d) ITM and 75 percent reduction in acaricide use but no change in cattle mortality and productivity from (b) and (c) (ITM75-NC); and (e) ITM and a 75 percent reduction in acaricide use and changes in cattle productivity from (b), (c) and (d) (ITM75-WC).

ECF mortality rates for the BASE farm for calves (less than one year old) were estimated at 20 and 15 percent for Kilifi and Uasin Gishu farms respectively while, for mature cattle (more than one year old) mortality rates were estimated at 10 percent in both areas on the basis of available literature (Mukhebi, et al., 1992). Live weights for different age-classes of cattle were estimated during the survey. The average weights were 80, 200 and 300 kg for calves, heifers and immature males, and mature cows respectively for farms in the two areas. However, the upper limit on body weights for each class of cattle were higher for the Uasin Gishu District farms because cattle in the former are highly productive pure-bred Taurine

breeds as opposed to the crosses for the latter. The average annual milk yield per cow was 1260 and 960 kg for the small and large farm respectively in Kilifi District and 1680 and 2400 kg for the small and large farms respectively in Uasin Gishu District (Nyangito, 1992).

The four ECF control strategies based on ITM were analysed by simulating the farm with changes in mortality rates and productivity effects on cattle associated with each strategy in relation to the current control strategy. Introduction of ITM was assumed to reduce mortality rates and increase cattle productivity. Based on available literature and discussions with researchers and extension specialists, mortality rate was assumed to decrease by 80 percent to 4 and 3 percent for calves in Kilifi and Uasin Gishu districts respectively and 2 percent for mature cattle in both areas. Increases in live weight gain as a result of introducing ITM were estimated at 10 and 5 percent for calves and immature cattle respectively, while the increase in milk production was estimated at 25 percent. These estimates were assumed to prevail for strategies ITM, ITM50 and ITM75-NC. The increases in productivity for ITM75-WC were assumed to be lower than for the other ITM strategies by 5% in milk production and live weight gain. The lower productivity for ITM75-WC is attributed to the high intensities of tick infestation resulting from the large reductions in acaricide.

RESULTS

The financial and economic performance of alternative ECF control strategies on the Kilifi and Uasin Gishu districts are presented in Tables 2 and 3. The simulation results indicate that all immunisation strategies (ITM, ITM50, ITM75-NC, and ITM75-WC) generated higher mean values for output variables (e.g. NPV, IRR, BCR, cash receipts, and net cash and net farm income) than the BASE ECF control method. While ITM75-NC generated the highest mean values for the output variables over the ten year simulation period, ITM values were the lowest over the BASE, with ITM50 and ITM75-WC values falling in between.

Kilifi District Farms

Overall, for the small and large farms the percent increase in the magnitude of selected output variables for ITM strategies over the BASE scenario were respectively as follows: NPV between 68 - 78 percent and 331-379 percent; BCR between 46 - 62 percent and 65-78 percent; IRR between 40 - 47 percent and 265 -295 percent; net farm income between 32 - 37 percent and 52 - 58 percent; and PVENW between 60 - 68 percent and 74 - 89 percent (Table 2). The probability of the small farm attaining an IRR at least equal to the rate of discount (12.60) and a BCR at least equal to unity was estimated at 100 percent for each control strategy (Table 2). The probability of the large farm attaining an IRR at least equal to the rate of discount and a BCR at least equal to unity was estimated to be between 97-100 percent for all the control strategies. These probabilities measure the probability of economic success of the farm from adopting each alternative strategy.

These results indicate that even though the current ECF control strategy is profitable to the smallholder farmer, the new ECF control strategies would likely be more profitable, with ITM75-NC being the most profitable control strategy. In addition to improving farm profitability, immunisation would also lead to substantial growth of the farm's capital wealth over time.

Uasin Gishu District Farms

The results of simulated financial and economic output variables for the small farm and the large farm (Table 3) in Uasin Gishu District show a similar trend to the results for the farms in Kilifi District. For the small farm, NPV increased by 23-27 percent, BCR increased by 22-30 percent, IRR increased by 17-20 percent, net farm income by 27-35 percent and PVENW increased by 13-16 percent over the BASE ECF control strategy. The corresponding percent increases for the large farm were; NPV 200-225 percent, BCR 212-250 percent, IRR 159-168, net farm income 119-134 percent and PVENW 192-215 percent over the BASE ECF control. The results indicate that ITM control strategies are also economically profitable and can lead to substantial financial and economic gains for farmers in Uasin Gishu District.

The probability of attaining an IRR at least equal to the rate of discount and a BCR at least equal to unity for the small farm was estimated at 100 percent for all ITM strategies. For the large farm, the probability that IRR would be greater or equal to the discount rate was between 6-10 percent for ITM strategies while, it was 0 percent for the BASE. The probability of a BCR being at least equal to unity ranged between 98-100 percent. These results imply that the degree of economic success for ITM on the small farm is higher than for the large farm.

Small Versus Large Farms

When the magnitude of the financial and economic variables are compared between small and large farms in each of the two areas, the small farm in Kilifi District tends to have higher means for NPV and PVENW for the ITM control strategies than the large farm while, the opposite is true for Uasin Gishu District farms. However, IRR and BCR tend to be higher for the small farms than for the large farms in both districts. Thus, using the mean BCR and IRR to recommend the type of farms that would use the ITM strategies could discriminate against the large farms. On the other hand, selecting or recommending farms that should or should not use ITM control strategies on the basis of highest mean NPV would discriminate against the small or large farm depending on the district under consideration. These results are consistent with findings in the literature which indicate that selection of independent investments using either NPV, IRR or BCR can be misleading (Gittinger, 1982). The three criteria are only useful in showing the investments that meet the selection criteria for economic acceptability rather than ranking them directly. Consequently, the alternative ECF control strategies were analysed using the stochastic dominance criterion.

Stochastic Dominance Ranking and Confidence Premiums

The SDWRF rankings of the alternative ECF control strategies with their associated confidence premiums for the two farms are shown in Table 4. The ITM75-NC was the most preferred strategy over the BASE ECF control strategy on both the small and large farm taking into account farmers' risk preferences. The confidence premiums associated with this strategy over the BASE were Kshs 1771 and 1750 per animal on the small and large farms respectively in Kilifi District. The estimates for Uasin Gishu farms for the same strategies were Kshs. 1580 and 2552 per animal for the small and large farms respectively. The confidence premiums among all the other alternative control strategies were lower on both

farms than the levels between the ITM75-NC and the BASE (Table 4). These premiums are indications of how much farmers would benefit from immunising one additional animal in moving from the challenger to adopting the dominant control strategy (Table 4).

Kilifi versus Uasin Gishu Farms

The magnitude of the financial and economic results for farms of same size are higher for Uasin Gishu farms than for Kilifi farms when ITM is introduced. This implies that Uasin Gishu District farmers would gain more from adopting immunisation when compared to Kilifi District farmers. The differences in the financial and economic impacts for the two areas would partly be explained by the numbers and type of cattle breeds that are kept. Uasin Gishu District farmers tend to keep a large number of cattle which are the more productive pure-bred Taurine breeds or grade cattle of a higher pedigree while, Kilifi District farmers tend to keep fewer grade cattle which are also the less productive of a lower pedigree.

CONCLUSIONS

The results from this analysis have indicated that strategies for ECF control based on ITM were financially and economically more profitable than the current acaricide based control method on both the small and large farms in the two regions studied. The more ITM allowed a reduction in the cost of using acaricides, the higher was the level of profitability achieved, other model parameters held constant. The results also indicate that Uasin Gishu District farms would gain more from adopting immunisation when compared to Kilifi District farms while, the large farms in each region would gain more than the small farms. On the basis of confidence premiums generated by the stochastic dominance criterion attached to the most preferred strategy (ITM75-NC), the large farm in Uasin Gishu District had the highest value. The implication is that farmers who face a more severe risk from ECF are more willing to pay more for the new technology.

The results from this study are based on data from merely four case study farms, which are by no means truly representative of all farms in Uasin Gishu and Kilifi Districts. However, the results are a good indication of the relative orders of magnitude of the farm level financial and economic effects of ECF immunisation by ITM. The whole farm simulation model used for analysis has the advantage of incorporating the risk aspects involved in farm production, and of estimating the farmer's premium for risk preference associated with a given ECF control strategy. Thus, this model could be usefully applied for assessing the economics of ITM in other smallholder livestock production systems.

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Table 1. Characteristic Features of the case Study Farms

	Kilifi farms		Uasin Gishu farms	
	Small	Large	Small	Large
Hectares (Total) owned	3.0	10.8	3.8	28.8
Rented	0.0	0.0	0.0	0.0
Assets (1000 Kshs) (Total)	125	323	397	2413
Cattle	28	61	211	232
Other	97	262	186	2181
Liabilities (Total)	0	0	0.0	21
Cropland (ha)	1.8	5.2	2.0	20.0
Pastureland (ha)	1.2	5.6	1.8	8.8
Crops				
Maize (ha)	0.4	4.0	0.7	2.8
Napier Grass (ha)	1.0	0.0	1.6	0.0
Coconuts (ha)	0.2	1.0	0.0	0.0
Cashew (ha)	0.1	0.1	0.0	0.0
Citrus Fruits (ha)	0.1	0.0	0.0	0.0
Mangoes (ha)	0.0	0.1	0.0	0.0
Potato (ha)	0.0	0.0	0.4	0.5
Pyrethrum (ha)	0.0	0.0	0.5	0.0
Maize-Beans (ha)	0.0	0.0	0.3	0.0
Wheat (ha)	0.0	0.0	0.0	1.4
Oats (ha)	0.0	0.0	0.0	1.4
Cattle				
Number of Cows	2.0	3.0	3.0	23.0
Number of Heifers	2.0	2.0	2.0	12.0
Number of Calves	1.0	3.0	1.0	17.0
Total Herd size	5.0	8.0	6.0	52.0
Other Livestock				
Number of Ewes	0.0	0.0	1.0	6.0
Number of Nannies	2.0	7.0	2.0	5.0

Table 2. Summary of selected output variables from simulating alternaative ECF control Startegies for cattle farms in Kilifi didtrict, Kenya

VARIABLE	SCENARIO				
	Base	ITM	ITM50	ITM75-NC	ITM75-WC
Probability-a					
IRR >= 12.60%					
Small	100.0	100.0	100.0	100.0	100.0
Large	0.0	97.0	100.0	100.0	98.0
Probability[b]					
BCR >= 1.0					
Small	100.0	100.0	100.0	100.0	100.0
Large	92.0	100.0	100.0	100.0	100.0
Net Present Value[c], 1000 Kshs (Mean)					
Small	87	146	152	155	147
Large	29	125	134	139	128
Present Value Ending Net Worth (PVENW)[d], 1000 Kshs (Mean)					
Small	263	420	433	442	419
Large	227	395	419	430	402
Internal Rate of Return (IRR)[e] (% Mean)					
Small	23.46	32.90	33.87	34.37	33.06
Large	4.28	15.63	16.51	16.92	15.91
Benefit Cost Ratio (BCR)[f] (Mean)					
Small	3.20	4.68	5.00	5.18	4.96
Large	1.2	1.98	2.08	2.13	2.04
Annual Cash Receipts[g], 1000 Kshs (Mean)					
Small	28	34	34	34	33
Large	59	69	69	69	68
Annual Cash Expenses[h], 1000 Kshs (Mean)					
Small	13	13	13	12	12
Large	42	38	37	36	36
Annual Net Cash Farm Income[i], 1000 Kshs (Mean)					
Small	14	21	21	22	21
Large	16	32	33	33	32
Annual Net Farm Income[j], 1000 Kshs (Mean)					
Small	19	25	26	26	25
Large	31	47	48	49	47

[a] Probability of IRR >= 12.6 - Chance that the farm will generate an internal rate of return greater than the discount rate, 12.6 percent.

[b] Probability of BCR >= 1.0 - Chance that the farm will generate a BCR greater than or equal to one.

[c] Net Present Value - Discounted value of the difference between the farm's total cash and non-cash receipts (returns) and cash and non-cash expenses (costs); it is a net return to initial equity.

[d] Present Value Ending Net Worth - Discounted value of farm's net worth in the last year simulated.

[e] Internal Rate of Return - A rate of discount which yields a zero net present value; it is a rate of return to capital invested in the farm operation.

[f] Benefit Cost Ratio - The ratio of present value for annual returns divided by the presentvalue of annual costs.

[g] Annual Cash Receipts - Total cash receipts from crops, cattle, and other farm-related activities.

[h] Annual Cash Expenses - Total cash costs for crop and livestock production, including interest costs and fixed cash costs; excludes depreciation.

[i] Annual Net Cash Income - Total cash receipts minus total cash expenses; excludes family living expenses, principal payments, and costs to replace capital assets.

[j] Annual Net Farm Income - Net cash farm income minus consumptive use depreciation for machinery and minus family consumption.

Table 3. Summary of Selected Output Variables From Simulated Alternative ECF Control Strategies for Farms in Uasin Gishu District

	SCENARIO				
VARIABLE	BASE	ITM	ITM50	ITM75-NC	ITM75-WC
Probability IRR> 12.6(%)[a]					
Small	100.0	100.0	100.0	100.0	100.0
Large	0.0	9.0	10.0	10.0	6.0
Probability BCR > 1.0(%)[b]					
Small	100.0	100.0	100.0	100.0	100.0
Large	2.0	98.0	100.0	100.0	98.0
Net Present Value (NPV)[c], 1000 Kshs (Mean)					
Small	321	391	402	406	399
Large	-543	566	643	679	547
Present Value Ending Net Worth (PVENW)[d], 1000 Kshs (Mean)					
Small	1348	1521	1551	1565	1542
Large	1153	3400	3557	3630	3361
Internal Rate of Return[e] (% Mean)					
Small	18.92	22.05	22.52	22.76	22.39
Large	-13.26	8.07	9.02	9.45	7.85
Benefit Cost Ratio[f] (Mean)					
Small	3.99	4.88	5.13	5.26	5.17
Large	0.54	1.70	1.83	1.89	1.69
Average Annual Cash Receipts[g], 1000 Kshs (Mean)					
Small	45	51	51	51	50
Large	325	396	396	396	386
Average Annual Cash Expenses[h], 1000 Kshs (Mean)					
Small	37	36	35	34	34
Large	405	293	280	274	286
Average Annual Net Cash Farm Income[i], 1000 Kshs (Mean)					
Small	9	15	17	17	16
Large	-80	103	16	122	100
Average Annual Net Farm Income[j], 1000 Kshs (Mean)					
Small	26	33	34	35	34
Large	-153	33	46	52	30

[a, b, c, d, e, f, g, h, i, and, j] are as defined for Table 2.

Table 4.Ranking of Alternative ECF Control Strategies in Kilifi and Uasin Gishu Districts, Kenya

		Kilifi Farms		Uasin Gishu Farms	
		Small	Large	Small	Large
Rankings					
Most Preferred Method		ITM75-NC	ITM75-NC	ITM75-NC	ITM75-NC
2nd Most Preferred Method		ITM50	ITM50	ITM50	ITM50
3rd Most Preferred Method		ITM75-WC	ITM75-WC	ITM75-WC	ITM
4th Most Preferred Method		ITM	ITM	ITM	ITM75-WC
Least Preferred Method		BASE	BASE	BASE	BASE
		Mean Confidence Premiums per Animal per Year			
Dominant	Challenger	Kshs	Kshs	Kshs	Kshs
ITM75-NC	ITM50	64	57	76	55
ITM75-NC	ITM	408	378	422	242
ITM75-NC	ITM75-WC	235	199	196	247
ITM75-NC	BASE	1771	1750	1580	2552
ITM50	ITM	215	206	196	126
ITM50	ITM75-WC	106	84	45	301
ITM50	BASE	1514	1520	1280	2326
ITM	ITM75-WC	2	36	106[a]	44
ITM	BASE	1130	1266	1280	1949
ITM75-WC	BASE	1195	1192	1144	1842

[a] ITM75-WC is ranked higher than ITM, therefore the premium refers to the change from ITM to ITM75-WC

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2.5

ANIMAL DISEASE RESEARCH FOR FOOD SECURITY IN SUB-SAHARAN AFRICA: THE CASE OF THEILERIOSIS AND TRYPANOSOMIASIS IN THE PREFERENTIAL TRADE AREA

A.W. Mukhebi[a] , B.D. Perry[b] and R. Kruska[c]

ABSTRACT

This paper highlights the growing divergence between the supply and demand for livestock products in sub-Saharan Africa with special reference to the Preferential Trade Area (PTA) region. Livestock diseases, especially theileriosis and trypanosomiasis, among other constraints, are identified as a major contributor to the growing deficits in livestock products. The impacts of these two diseases and of their control is discussed, and the role of the International Laboratory for Research on Animal Diseases in developing improved disease control measures is highlighted.

INTRODUCTION

During the past three decades, per capita food production in sub-Saharan Africa (SSA) (including the Preferential Trade Area -PTA- region), has been declining (Yaker, 1993). The level of production indices stagnated at around 99.4 in 1980-83 and gradually declined to 93.8 in 1990, with a continuing deterioration in subsequent years (FAO 1990 in Yaker, 1993). On the other hand, the region's food demand has been rising at the rate of 2.9% per annum since 1970 (Yaker, 1993), with increasing dependency on food imports and food aid. Given the declining per capita food production, limited foreign exchange for increased food imports and declining food aid flows, future food availability and security in the region are seriously threatened.

IMPORTANCE OF LIVESTOCK PRODUCTS

A search for new technical innovations to increase food supply offers the most practical way of solving the food crisis in the region. While efforts to increase food production and security have concentrated on crop production, the improvement of livestock production would also be an important strategy.

Livestock serve a variety of economic, social and environmental functions. They are an integral component of agricultural systems and contribute to meeting human needs for

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food, income, employment and work-power. Animal products play a significant role in human diets. Foods of animal origin are the only reliable dietary source of the essential vitamin B12 and supply an array of readily absorbable minerals, protein and nutrients. Livestock products (meat, milk and eggs) make up 26% of recorded agricultural output in developing countries. Unrecorded outputs (hides, skins, fibre, manure, draught power) are estimated at up to half the value of the recorded commodities, making livestock contribution to overall output in the range of 30% to 40%. Much of the unrecorded output is an essential input to crop production. At the same time, livestock convert the otherwise unusable plants and by-products of cropping systems into high value products usable by man. In addition, livestock serve as forms of insurance against agricultural risks, savings and wealth, and social functions.

DEMAND AND SUPPLY OF LIVESTOCK PRODUCTS

The rapid growth of human population, demographic shifts towards urbanization and modest income growth rates are forces which are leading to not only increasing demand for food in SSA, but also to changing the composition of that demand towards products of higher value such as animal products and fine grains. In the whole of SSA, population is expected to increase by an annual average growth rate of 2.7% from an estimated 500 million in 1992 to nearly 1.3 billion in 2025. During the same period, the proportion of people living in urban areas is projected to increase from 30% to 55% (Winrock International{WI}, 1992). However, per capita income is projected to grow only modestly, with some countries experiencing stagnant or negative growth rates in some years.

According to Winrock International (1992), SSA changed from being a net exporter to a net importer of beef during the 1960s. Current total meat imports by the region are about 140,000 tons annually (about 3% of total meat consumption) valued at US$ 200 million. If production trends do not improve, meat production in 2025 would be about 12 million tons, only 65% of the production growth target, and cow and goat milk production would be about 32 million tons, only 75% of the production growth target. This scenario would lead to imports of 7 million tons of meat and 11 million tons of milk at a cost of US$ 16 billion annually, which the region could ill afford.

In view of this increasing cost of food imports, limited foreign exchange, and declining food aid flows, there is no alternative for most countries of the region but to achieve a degree of self-reliance in food through improved domestic production.

The PTA region, being a major part of SSA, is expected to experience the above trends in the demand for and supply of livestock products.

ANIMAL DISEASE CONSTRAINTS TO INCREASED LIVESTOCK PRODUCTION

The challenge of meeting the steadily growing demand for livestock products in the region is posed by a variety of constraints, among which disease ranks high, others being poor nutrition, limits on productivity potential of indigenous animal genotypes, limited availability of agricultural land due to high human population pressure particularly in highland ecozones, poor management practices, inappropriate policies and institutional (research, extension, training, animal health services) inadequacies.

Despite intensive efforts by past and present veterinary services, disease remains a major constraint to livestock production and hence food production and security in much of SSA. WI (1992) points out that animal diseases substantially reduce the productivity of livestock in all agroecological zones and production systems in SSA. They cause substantial losses even in indigenous livestock types, and severely limit the viability and adoption of improved breeds. Annual losses of US$ 4 billion represent approximately 25% of the total value of livestock production in the region. The most important animal disease constraints are the parasitic and viral diseases, mainly vector-transmitted, which are widely distributed in the region. No effective and easily administered vaccines or chemotherapeutic agents exist for the control of these diseases. The most important diseases in this group are tse-tse transmitted trypanosomiasis; tick-transmitted theileriosis, cowdriosis, anaplasmosis and babesiosis; dermatophilosis; and African swine fever.

Epidemic diseases such as rinderpest and contagious bovine pleuropneumonia make livestock raising too risky for governments or farmers to invest in improvements. However, effective control measures already exist for these diseases and are successfully being implemented through cooperative efforts between governments and international agencies.

As development progresses, a large group of infectious, parasitic, and noninfectious diseases associated with intensification will become more important constraints to productivity. The inability of many countries to maintain effective surveillance and control measures and lack of effective means of delivering veterinary services throughout SSA are major impediments to effective animal disease control.

INTERNATIONAL LABORATORY FOR RESEARCH ON ANIMAL DISEASES

The International Laboratory for Research on Animal Diseases (ILRAD) was established in 1973 by the Consultative Group on International Agricultural Research (CGIAR), with a global mandate to conduct intensive basic and strategic research leading to improved control of important livestock diseases in developing countries, particularly in Africa.

ILRAD chose to focus its research initially on the immunological and related aspects of controlling the two vector-borne disease complexes topping the list of animal disease constraints referred to above: the tsetse-transmitted trypanosomiasis and tick-borne theileriosis (mainly East Coast fever or ECF). These diseases remain the major factors inhibiting the integration of livestock into SSA's agricultural production systems, including those of the PTA countries. Improvement in livestock and food production and security in the region can not be achieved significantly until these diseases are successfully controlled. It was envisioned, however, that ILRAD could eventually extend its research to other serious disease problems for which its facilities and expertise are appropriate (ILRAD, 1993a).

ILRAD'S RESEARCH PROGRAMMES AND PROGRESS

ILRAD's research focuses on the development of technologies that are safe, socioeconomically viable, environmentally sound and sustainable over the long term for the control of these major diseases of livestock in the PTA countries, other parts of Africa and the

world. Research is organized under four programmes: Tick-borne Diseases, Trypanosomiasis, Socioeconomics and Training and Outreach Programmes.

The Tick-Borne Diseases Programme

The Tick-borne Diseases Programme aims at developing new vaccines against *Theileria parva,* the causative agent of theileriosis, in the expectation that research results and methodologies will be appropriate to the development of improved vaccines against the other tick-borne diseases. Work is continuing on the improvement of the *infection and treatment method* (Radley, 1981) of immunization against theileriosis to make it more effective and acceptable.

The Programme supports regional and national disease control projects, many of which are located in the PTA member countries. ILRAD assists staff running these projects by employing an array of advanced laboratory tests to define and characterize parasites obtained from their field sites, by providing the national projects with reagents for the accurate diagnosis of tick-borne diseases, and, through ILRAD's Socioeconomics Programme, by developing and using methodologies to help assess the economic costs (losses or impacts) of diseases and their alternative control measures, to provide information for making better decisions on the choice of cost-effective and sustainable control strategies.

The *infection and treatment method* of immunization against theileriosis has been field tested and is being applied in several PTA countries. However, it is not optimal as live organisms are used, and the immunity induced is parasite strain specific. ILRAD is currently developing an alternative improved vaccine based on genetic engineering for the control of the disease. The results to date show that an antigen resident on the surface of sporosoites can provide 70-100% protection against a lethal dose of parasites. Further studies are underway to develop this vaccine for use in the field in the region within the next few years.

The Trypanosomiasis Programme

The Trypanosomiasis Research Programme aims ultimately at developing low-cost, effective and simple vaccines for the control of trypanosomiasis. Research scientists are also concentrating on the development of diagnostic methods and improvement of the effectiveness of current control methods, which involve the use of insecticides to control the fly and the use of drugs to treat infected animals. No new trypanocidal drugs have been developed by the pharmaceutical industry in the last 30 years, and the problem of drug resistance in certain forms of the disease is now acute. The Programme also conducts studies on the resistance to trypanosomiasis exhibited by some native cattle, particularly the N'Dama and the West African Shorthorn breeds, with the view to exploiting the trait for the control of disease in certain environments.

The Programme has developed highly sensitive tests (monoclonal-antibody-based ELISAs) for distinguishing trypanosome species. Other ELISA systems are under development for detection of a commonly used trypanocidal drug in infected and treated animals. The improved ability to detect both parasites and levels of trypanocides in livestock will enable disease control workers to rapidly identify parasite drug resistance in epidemiological surveys.

The Socioeconomics Programme

The application of new disease control technologies may cause varying beneficial as well as deleterious effects in different livestock production systems. The objective of ILRAD's Socioeconomics Programme (SEP) is to assess and predict probable social, economic and environmental impacts of improved livestock disease control in order to enhance the beneficial and minimize or forestall the deleterious effects. The Programme is developing computer models for evaluating the efficacy of various control measures for tick-borne diseases and trypanosomiasis to help decision-makers determine which measures will best benefit livestock-keeping communities in endemic areas in sustainable and environmentally sound ways. Through this Programme, ILRAD is pioneering the use of geographical information systems - computer programs designed to manipulate and analyze large amounts of spatial data - to determine the epidemiology of a livestock disease in an area, country or region of the developing world and to extrapolate results of disease control impact assessments to wider geographic areas.

The Training and Outreach Programme

The training and Outreach Programme promotes cooperative research and technology transfer, conducts training activities and disseminates information and research results. It provides scientists and technicians, most of them from African institutes, with individual training at the Laboratory for period of one week to six months. Graduate students, most of them from Africa and supported by ILRAD fellowships, undertake research work at ILRAD leading to graduate degrees. In addition, ILRAD provides senior African scientists with fellowships to conduct post-doctoral studies at ILRAD.

Selected ILRAD publications and reports are widely distributed to individuals and institutions throughout the PTA region, Africa and in other parts of the world. Through these publications and reports, ILRAD's research findings are disseminated and are of direct relevance not only to scientists conducting strategic research on specific animal diseases and their control but also to those conducting basic research in a wide variety of biological disciplines in the region.

The above research activities of ILRAD, aimed at improving the efficacy of current control measures for livestock diseases and developing better new ones, are expected to contribute significantly to improved livestock and food production in the PTA region.

Starting January 1, 1995, ILRAD and ILCA (the International Livestock Centre for Africa based in Addis Ababa, Ethiopia) were merged into a new CGIAR centre, the International Livestock Research Institute (ILRI) with Headquarters in Nairobi, Kenya.

ESTIMATING THE ECONOMIC IMPACT OF THEILERIOSIS AND TRYPANOSOMIASIS IN THE PTA REGION

The control of trypanosomiasis and tick-borne diseases particularly theileriosis continues to cost farmers, governments and agencies large sums of money annually in livestock productivity losses, deaths and control expenditures. However, these costs have not been systematically quantified. ILRAD's SEP is conducting research studies in collaboration

with scientists in National Agricultural Research Systems (NARS) in the PTA region aimed at estimating the costs of these diseases, for assessing the economics of existing and new improved control measures.

The major reasons for the prevalence of these diseases in the region are the persistence and expansion of the distribution of tsetse flies and trypanosomiasis, outbreaks of non-tsetse-transmitted trypanosomiasis, development of drug resistant parasites, and the inadequacy and expense of cattle-dipping regimes to control the tick vectors of the tick-borne diseases.

Spreadsheet model

A spreadsheet model developed in Lotus 123© (Lotus Development Corporation) (Mukhebi *et al.,* 1992), schematically represented in Figure 1, is being applied by SEP for estimating economic costs of theileriosis and trypanosomiasis and assessing the economics of their control by alternative strategies.

Given input data on the size, composition and production parameters (e.g. calving rate, milk, meat, manure and draught power yield, animal off-take rates, production costs and output prices) of a livestock population at risk from a disease, and the epidemiological parameters of the disease (i.e. incidence and case fatality rates by animal age group), the model calculates the economic cost of the disease under a specified and costed control strategy.

The annual economic cost of the disease is calculated as the sum of the value of product losses from mortality and morbidity, control and treatment costs. This can be represented by the following equation:

$$C = MP_m + BP_b + DP_d + NP_n + A + T$$

Where: C = economic cost of a disease;
M = quantity of milk lost;
B = quantity of meat lost;
D = number of draught work days lost;
N = quantity of manure lost;
A = cost of control measures;
T = cost of treatments for clinical cases;
P_i = farm level price of product $_{i}$, $_{i = m, b, d, n}$.

In addition to the economic cost, the spreadsheet model also calculates the annual value of cattle output and the total and per animal net income, using similar accounting equations. The model calculates annual values (economic cost, production expenses and revenues) over a ten year period. These are discounted and expressed in present value terms, and a benefit-cost ratio and an internal rate of return are derived. Results of alternative control strategies are compared using these economic/financial indicators.

Estimated economic costs of theileriosis and trypanosomiasis in the PTA region

Mukhebi *et al.* (1992) applied the spreadsheet model to estimate the economic cost of theileriosis in 1989. The analysis was revised for the 18 PTA countries using the Food and Agriculture Organization (FAO) cattle figures for 1991 (Table 1). Geographic information systems (GIS) at ILRAD was used to estimate the proportion of national cattle populations in the region that were at the risk of the two diseases (Table 1).

Out of a cattle population of about 84 million head in the PTA region, 33% were estimated to be at the risk of theileriosis and 23% at the risk of trypanosomiasis per year (Table 1). The annual economic cost of theileriosis was estimated to be US$ 163 million (Table 2) or US$ 5.82 per animal.

There is insufficient epidemiological data to estimate the economic cost of trypanosomiasis in each country. However, ILRAD (1993b) estimated the economic cost of trypanosomiasis to be US$ 7.60 per head of cattle at risk (a total of US$ 1.8 million) per year in Zimbabwe and US$ 1.30 in the Gambia. The economic cost per animal in these two countries is thought to be at the extremes. Therefore taking their simple average (US$ 4.45 per animal per year) and applying it to the cattle population (18.8 million) at risk in the 17 other PTA countries (Table 1) and adding the cost for Zimbabwe yields an annual economic cost of US$ 85 million (Table 2) due to trypanosomiasis in cattle alone.

The actual economic costs due to these two diseases are considerably larger than the above estimates when the costs in other livestock types (e.g. sheep and goats), and indirect costs of these diseases, such as the constraint on livestock genetic improvement, environmental consequences resulting from the use of chemicals for the control of the disease vectors, and lost trade and employment opportunities, are taken into account.

Economics of alternative disease control strategies

It is not sufficient to calculate the economic cost of a disease. Although such a calculation provides an indication of the economic importance of a disease, it does not provide information for decision making about optimal control strategies to adopt. Such information can be generated by analysis of the economics of the alternative control strategies. The spreadsheet model is being applied by SEP to assess the economics of alternative control strategies for both theileriosis and trypanosomiasis in deferent livestock production systems in SSA, especially in the PTA countries.

For instance, in a smallholder dairy system at the Kenya coast, Mukhebi *et al.* (1994) show by an *ex-ante* analysis that ECF immunization would be financially profitable to the farmer. The economic cost of the disease would be reduced by 28-40% in indigenous Zebu cattle, and by 40-70% in genetically improved cattle, yielding increases in net income of 24-103% under a variety of alternative control scenarios. The benefit:cost ratio from immunization ranged from 2 to 5. Similar analyses are being conducted in different cattle production systems in selected countries to assess the financial viability of the infection and treatment method of immunization.

SUMMARY

Livestock are an integral part of agricultural systems and provide substantial contribution to food production and to other welfare needs of households and national economies in the PTA region. Production of livestock products in the region is projected to grow, but not to keep pace with demand, leaving deficits. Due to foreign exchange scarcity in all the countries of the region and given declining food aid flows, most of these deficits will have to be met from increases in domestic production if food insecurity is to be avoided. However, livestock production and improvement in the region is severely limited by the widespread prevalence of diseases.

ILRAD was established in 1973 by the CGIAR to conduct basic and strategic research aimed at successful control of the major diseases limiting the contribution of livestock to food production in the region. Its research is organized under four programmes: Tick-Borne Diseases, Trypanosomiasis, Socioeconomics and Training and Outreach. Its focus on tsetse-transmitted trypanosomiasis and tick-transmitted theileriosis have over the years produced information and diagnostic materials of immediate utility and benefit to scientists conducting research and to governments and agencies implementing disease control programmes particularly in Africa. The assessments of the economic impacts of livestock diseases and their alternative control strategies generate information useful for implementing better and more sustainable control programmes. By developing technologies and generating information for improved disease control, ILRAD's research is effectively contributing to increased livestock production and hence food security, not only in the PTA region but also throughout the world.

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Table 1. Estimated population of cattle under Theileriosis and Trypanosomiasis risk in the Preferential Trade Area, 1991.

	National cattle population '000 head	Cattle population at risk[b] of Theileriosis '000 head	Theileriosis % of national herd	Trypanosomiasis '000 head	Trypanosomiasis % of national herd
Angola	3100	0	0	620	20
Burundi	435	435	100	13	3
Comoros	47	0	0	0	0
Djibouti	170	0	0	0	0
Ethiopia	30000	0	0	3600	12
Kenya	13700	10420	76	2603	19
Lesotho	540	0	0	0	0
Malawi	1150	863	75	35	3
Mauritius	34	0	0	0	0
Mozambique	370	671	49	521	38
Rwanda	630	624	99	69	11
Somalia	4900	0	0	588	12
Swaziland	750	0	0	0	0
Seychelles	2	0	0	0	0
Tanzania	13138	4073	31	7620	58
Uganda	5000	4150	83	2100	42
Zambia	3045	2162	71	1066	35
Zimbabwe	5950	4284	72	238	4
Total PTA	83961	27682	33	19073	23

Sources: a) FAO Production Yearbook Vol.45, 1992.
b) ILRAD estimations using GIS.

Table 2. Distribution and estimated impact of Theileriosis and Trypanosomiasis in the Preferential Trade Area, 1991.

Disease	Land area affected mil.ha	% total PTA	Cattle at risk mil.head	% total PTA	Estimated economic cost US$ mil 1991
Theileriosis	138	20.4(37.2)[a]	28	32.9(62.2)[a]	163[c]
Trypanoso-	88	13.1(13.2)[b]	19	22.8(23.2)[b]	85[c]

Source: Summarized from Table 1.
Notes: a) Percentage of total of 9 affected PTA countries.
b) Percentage of total of 12 affected PTA countries.
c) Annual cost in all affected countries.

SESSION 3: RESOURCE ACCESS AND UTILISATION

Chairman: I. Rop

Rapporteur: D. Mulenga

3.1

USING HOUSEHOLD TRADITIONAL FARMING SYSTEMS SURVEYS TO FORMULATE AGRICULTURAL POLICIES FOR FOOD SECURITY: THE CASE OF ULANGA DISTRICT, TANZANIA.

M.E. Mlambiti[a]

INTRODUCTION

Tanzania has grouped its population of economically active people into two main classes i.e. workers and farmers which implies that the country's economy is greatly dependent on these two groups of people. The country's economy is heavily dependent on the agricultural sector which employs over 90 percent of the rural population, contributes over 80 percent of the country's foreign exchange earnings, produces over 95 percent of the country's food requirements and contributes over 40% of the country's GDP (Mlambiti, 1987).

Objective of the Paper

The main objective of this paper is to show that analyses of the traditional farming system at a household level can be a good base for drawing up a national food security strategy.

Government Stand on Food Security Issue

The government of Tanzania's stand on food security is contained in the Agricultural Policy of 1983 (Ministry of agriculture and Livestock Development, 1983). The policy goals with respect to food security are achieving national self-sufficiency and raising the nutritional standards of living of all Tanzanians; earning foreign exchange for the nation apart from meeting its own sectoral needs; and developing an integrated agricultural sector, using methods of scientific husbandry and technology appropriate to the respective crops, size of operation and national resources (Rukuni et al, 1989).

Based on the Agricultural Policy, the Government launched a National Food Strategy (NFS) in 1984 (Ministry of agriculture and Livestock Development, 1984) which elaborated upon the options for attaining food security. The strategy emphasises production and incorporates projections of resources, including infrastructure, and agricultural inputs which would be needed for production targets to be met up to the year 2000.

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The National Food Security Status

Tanzania's food supply situation for the five years, 1984-85 to 1988-89 was very favourable despite sporadic food deficit pockets in some parts of the country caused by transitory drought or flood conditions (Table 1).

Table 1: Tanzania Mainland: Production Estimate 1983-84 to 1988-89 (000 MT.)

	83-84	84-85	85-86	86-87	87-88	88-89
Maize	1939	2093	2210	2359	2339	3125
Millet	760	1024	943	954	700	804
Paddy	356	427	547	664	629	720
Beans	540	441	321	425	386	503
Wheat	74	83	72	72	76	97
Banana	-	774	777	792	813	743
Cassava	-	2052	2031	1709	1744	1948
Sweet Potatoes	-	308	291	352	246	267
Total grains	-	4068	4039	4473	4130	5249
Roots & Banana	-	3134	3099	2854	2803	2959
Total Prod'n	-	7202	7192	7327	6933	8208
Population	-	2190478	21886612	22499437	23129421	23129431
Consumption	-	5440	5592	5749	5626	5926
Surplus/Deficit	-	1762	1600	1579	2131	2282

Source: Biseko, 1989, Table 1. p. 48.

Government Interventions in Increasing Access to Food

Major intervention by the Government in increasing access to food have been through: the price mechanism, reorganisation and rationalisation of the marketing and distribution system, nutrition programmes and food relief. Since the promulgation of the 1983 Agricultural Policy price mechanism intervention has been more used than direct interventions. Table 2 shows government intervention through price increase for major food crops.

Liberalisation of the food market has also improved accessibility to food. By removing the monopoly of the National Milling Corporation (NMC) on food trade and reducing internal trade barriers, open market consumer prices for maize declined thus increasing the real purchasing power of consumers.

Table 2: Tanzania. Commercial Producer Price (shs/kg)

	1986/87	1987/88	1988/89	1989/90
Maize	6	8	9	11
Rice	10	14	17	19
Wheat	7	9	10	13
Cassava	4	5	5	5
Sorghum/Millet	5	6	7	7
Beans	14	22	25	27

Source: Biseko, 1989 Table 3 p. 51.

METHODOLOGY

In order to address the objective of the study, farm level data were collected to provide micro-level picture of peasant farming in one district of Tanzania, the Ulanga District. Ulanga District was selected because it is a potential area for rice and maize production and its production is 100% by smallholder.

Data collected were based on a frequent visit survey, relying on the farmers ability to record daily farm activities in a special booklet. Farmers were assisted by enumerators specially trained for the purpose and also by the village assistant field officers. The data collected were analysed using tabular and gross margin analyses.

ULANGA DISTRICT HOUSEHOLD INCOME AND FOOD SECURITY SITUATION

Introduction

Ulanga District is one of the five districts that form the Morogoro Region. It is a sparsely populated area lying south of the Tazara Railway and the Kilombero River, and north of the Mbarika mountains. The agricultural production in the area is 100% smallholder type. The main crops grown include cotton as cash crop, maize and rice, both for food as well as cash crops. Other crops that are grown include sorghum, millet, beans, groundnuts, sunflower, cashewnuts and castor seed. The area is suitable for all types of the main crops found in Tanzania. Livestock keeping is done by a few farmers and mainly of small animals such as sheep, goats and chicken.

The production techniques used by the small holders are still mainly traditional characterised by high inputs and low output. As population increases and more farmers turn to settled agriculture, declining yields per unit of input is a typical feature.

Population and Social Infrastructure

The main tribes of the district are the Wapogoro, Wandamba, Wangindo, Wabena, Wangoni and Wambunga. These major ethnic groups in the district show diversity in their culture. According to economic activities, the people could be divided into two distinct groups that is farmers and fishermen. These together make up the district's population of 138,887 according to 1988 population census. The Wandamba and to some extent the Wabena and wangindo are traditionally fishermen whereas the Wapogoro, Wangoni and Wambunga are traditionally peasant farmers. Wildlife cropping has a significant contribution to the people's supply of animal protein.

Climate

The climate of the District is characterised by bimodal rainfall, falling mostly between November and May with two peaks occurring in December and April. the annual rainfall is about 2586 mm, falling in about 109 to 137 days a year.

Household Agricultural Incomes

Yield Levels

A survey carried out in four divisions of the District shows that average yield levels differ across the four divisions (Table 3).

Table 3: Ulanga District; Average yield for the three main crops by division in (kg/ha[1]).

Division	Paddy	Maize	Cotton
Lupiro	988	1174	452
Malinyi	1384	1409	714
Mtimbira	1186	1174	554
Ruaha	998	2113	633
District	1136	1467	588

Source: Compiled from frequent visit survey data

1 Since the survey covered one year only, these figures must be used with caution.

For the purpose of comparison, table 4 presents average yield data for low, medium and high potential areas in Tanzania employing different levels of technology. When figures in Table 3 and 4 are compared in the case of maize and paddy it is observed that Ulanga falls within high potential area. Given that production takes place under traditional farming systems (TFS), potential exists for achieving higher yield through use of improved technological packages.

Table 4: Tanzania. Yield levels in maize and paddy. National Estimates (kg/ha).

	Maize	Paddy
Traditional System (TS) in high potential area	110	-
TS in medium potential areas	750	-
TS in low potential areas	750	-
Improved package	1500-2700	-
Traditional Upland	-	400
Tradition Irrigated	-	2500
Improved seed but no fertiliser	-	3000
Improved seed with fertiliser	-	3600

Variability of Net Returns per Hectare by Crops by Farm Sizes

Table 5 shows variability in net return per hectare and per shilling of the variable costs by farm sizes based on 1985 prices. In the case of rice, it is observed that yield level decreases as the size of the farm increases while for cotton the reverse is the situation. It can also be said that the larger the farm, the more the variable costs and the less the net returns per shilling of the variable costs. Farm sizes of 0.4 ha or less seem to give the highest net returns per hectare for rice and maize.

Household Agricultural Incomes by Enterprises Based on 1985 Yields and Prices

Table 6 shows average gross margins per ha. and returns per man-day for Ulanga District for the three main crops of smallholder farms based on 1985 yield and prices. From this table it is clear that rice gives the highest gross margin per ha. followed by maize and cotton. A comparison on the basis of returns per manday gives a rather different picture. Maize crop seems to give highest returns per manday followed by rice and cotton respectively. A similar situation is demonstrated for returns per shilling invested. This is because under traditional farming system maize requires less labour and capital compared to the other two crops. Cotton is labour intensive and requires purchased inputs like insecticides in order to get higher yields.

The gross margin analysis helps to show which of the main food crops gives highest return per unit of a given limiting factor. This information is very useful to planners in deciding the likely effect of a food policy to a given population.

Table 5: Ulanga District: Variability in net returns per shilling of variable cost at peasant Farm Level Based on 1985 Prices

Crop	Farm Size	No. of farmers	Area of crop	Average yield per ha	Total revenue	Values per ha		
						Total variable cost	Net return	Net return per sh. of the variable costs
	Ha	Percent	Ha	Kg	----------Shs----------			
Rice	.4	35	6.6	1,384	17,297	618	16,679	27
	.8	35	32.0	1,186	14,826	1,000	13,818	14
	1.2	15	19.8	988	12,355	680	11,676	17
	1.6	7	14.2	988	12,355	672	11,683	17
	1.6	8	24.7	791	9,884	1,038	8,846	9
Average[1]				1,186	11,861	803	11,058	14
Maize	.4	58	22.7	1,643	12,973	371	12,062	34
	.8	28	23.1	1,174	9,266	680	8,587	13
	1.2	10	10.1	1,643	12,973	865	12,108	14
	1.6	4	7.7	1,174	9,266	1,161	8,105	7
Average[1]				1,409	11,120	769	10,351	13
Cotton	.4	74	24.7	404	5,762	877	4,885	6
	.8	24	15.8	507	6,635	786	5,849	7
	1.2	2	10.1	818	10,714	1,767	8,948	5
Average[1]				588	7,705	1,144	6,461	6

Source: Compiled from Frequent visit survey data, 1985.
Note: 1] Sum of the column figures divided by the number of rows i.e. farm size groups.

Table 6: Ulanga District Average Gross Margins per Ha. and Returns per Manday for the Three main crops on Smallholder Farm Based on 1985 Yields and Prices

	Rice		Maize		Cotton	
	A	B	A	B	A	B
Revenue						
Yield Bag/kg	15	30	15	25	588	1235
Price (shs)	1000	1000	750	75	13.10	13.10
Total	1500	3000	11250	18750	7703	16179
Cost seeds						
Amount (debe)	5	5	2.5	2.5	-	-
Price (shs)	200	200	150	150	-	-
Sub Total	1000	1000	375	375	-	-
Other Costs						
Tractor hire	-	1000	-	1000	-	1000
Herbicide[1]	-	1000	-	1000	-	1000
Hiring Sprayer[2]	-	75	-	75	200	200
Insecticide	-	-	-	-	890	890
Sub Total	-	2075	-	2075	1090	3090
Total Cost	1000	3075	375	2450	1090	3090
Gross Margin	14000	26925	10875	15300	6613	13089
Labour Input	459	269	145	57	316	195
Returns/Manday	31	100	75	286	21	67
Returns/shs	14	9	29	7	6	4

Source: Compiled from Frequent visit survey data, 1985.

Note: A is traditional farming system without tractor and herbicide

B is traditional farming system with tractor and herbicide

1] Herbicide reduces labour required to five manday while tractor for plowing reduces labour to two mandays of clearance

2] Charge for hiring sprayer is sh. 10/= per day.

Ulanga People's Consumption Pattern and the Food Security Issues

As stated earlier on, the main staple food for Ulanga people is rice which is usually taken together with fish or beans and/or vegetables when fish is not available. Maize, however, forms the main food item for the population in Mahenge area. Maize meal is normally consumed together with bean and/or vegetables for the majority of the people and with fish for those who can afford to buy it. Wildlife meat is an important source of animal protein for villages away from fishing areas and with limited open market. Table 7 shows proportions of dietary composition in the region and confirms the above statement and is supported by the results of the frequent visit survey as shown in Table 8.

According to table 8 the average household family size consumption of the two main food crops ranges from 5.7 for Ruaha Division to 12.4 bags of rice for Malinyi Division with a district average of 9 bags while it is from 5.7 bags of maize for Malinyi Division to 8.3 bags for Mtimbira Division with a district average of 7 bags per household. Thus under the traditional farming system, 9 bags of rice plus 7 bags of maize make the critical subsistence level of food requirement per average size of household. Any level below these poses serious food shortage to the household which could be supplemented by other food stuff like cassava, bananas, sweet potatoes etc. For the year of survey (1985), households who harvested below average levels range from 44 percent to 65 percent for rice and 55 to 63 percent for maize. These farmers had to acquire other food stuff usually cassava or to purchase food from local markets in order to meet family food demand.

Table 7: Morogoro Region: Proportions of Dietary Composition

District	Maize	Rice	Beans	Others
			as % of diet	
Morogoro (Urban)	50	35	10	5
Morogoro (Rural)	70	20	5	5
Kilosa	70	10	10	10
Kilombero	20	70	5	5
Ulanga	25	70	2.5	2.5
Average	48	40	4	8

Source: Morogoro Region Five Year Plan 1984/85 - 1988-89 Table 3.31

Table 8: Ulanga District: Main Food Consumption Levels Under the TFS by Divisions for an Average Household Family Size[1]

Division	No. of HH	Qty (bags)	Average per HH	% Below Average	No. of HH	Qty (bags)	Average per HH	% Below Average
Malinyi	32	398	12.4	44	30	170	5.7	63
Mtimbira	29	284	9.8	65	27	224	8.3	55
Lupiro	36	296	8.3	58	34	244	7.2	56
Ruaha	20	113	5.7	60	10	69	6.9	60
District	117	1091	9.0	50	101	707	7.0	58

Source: Compiled from frequent Visit Survey data, 1985.
Note: 1/ One bag of rice is 80 kg and maize is 95 kg. 2/ HH = Household.

Ulanga District does not have sufficient herds of livestock and depends on fish and wild game meat as the major sources of animal protein. As a matter of nutritional intervention, modern fish cropping and livestock introduction in the district is an issues of urgent significance.

Household Income and Food Security as Related to Remittance to Urban Areas.

The issue of household income and food security can not be complete without relating it to that of remittances to and from rural household to urban areas. Table 9 shows proportions of net remittances in cash and food by divisions of the Ulanga District. In general cash-outflows for the district is greater than cash-inflows. Percentage net outflows ranges from 12 percent in Malinyi to 4.4 in Mtimbira Division. This observation confirms the often states assertion that the rural sector is the foundation of urban development for most agricultural dependent economies.

The situation with respect to food remittances follows a similar trend. The analysis in table 9 shows that there is a net-outflow of food from the rural area to the urban area whose proportions differ from division to division and for the type of food crop. The amount of rice that is given out as remittance averages 3 percent of the total harvest for the district while that for maize is 6 percent. It should be noted that these remittances took place despite government limitation of quantities of food permitted to be taken out of the district.

Table 9: Ulanga District: Proportions of net remittances in cash and food Divisions, 1985[1]

Division	Cash (Shs)			Food					
				Rice			Maize		
	Out	In	Net out	harvest	as % of harvest	Remitted harvest (Debes)	harvest	% of harvest	Remitted harvest (Debes)
Lupiro	3,180	1,270	150	1,665	66	4.0	1,252	54	4.27
Malinyi	1,700	1,515	12	5,420	135	2.5	1,004	114	11.40
Mtimbira	12,607	2,350	436	1,691	50	2.9	1,165	25	2.10
Ruaha	12,547	9,375	34	586	20	3.5	317	20	6.24
District	7,509	3,628	107	2,340	68	2.9	934	53	5.7

Source: Compiled from Frequent visit survey data, 1985.

Note: 1 The figures do not include minor volumes of remittances recorded such as beans, cowpeas, cassava, green gram, chicken, etc.

SUMMARY OF THE MAIN FINDINGS

Food Consumption Pattern

- The main staple food is rice which is usually taken together with fish or beans and/or vegetables when fish is not available.

- Maize meal is the main food item for Mahenge area.

- Wildlife meat is an important source of animal protein for villages away from fishing areas.

- Under the traditional farming system, 9 bags of rice plus 7 bags of maize make the critical subsistence level of food requirement per average size of household.

- For the year of survey, households who harvested below average levels range from 44 percent to 65 percent for rice and 55 to 63 percent for maize. Food shortages are supplemented by other food staff like cassava, banana, sweet potatoes etc.

- The district has no sufficient herds of livestock and hence as a matter of nutritional intervention, modern fish cropping and livestock introduction urgent significance.

Remittances to and from the District

- Cash-outflows are greater than cash-inflows. Percentage net outflows range from 12% in Malinyi to 4.36% in Mtimbira division.

- There is a net-outflow of food from rural area to urban area whose proportions differ from division to division and for the type of food crop. About 6% of the total food harvested is given as remittances to urban relatives.

CONCLUSION

Discussion in this paper shows that in Ulanga District over 40 percent of households sampled in 1985 had harvests below the critical subsistence levels. Such households had to depend on other non traditional food crops in order to meet the critical subsistence level gap. Thus, national programmes aimed at making farmers produce such non traditional foods in District with food shortages are important if household food security strategy is to be successful. Therefore, on the basis of data on production and consumption pattern under the TFS government could design appropriate food security strategy for a given area.

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3.2

AN EVALUATION OF INSTITUTIONAL CREDIT AND ITS ROLE IN AGRICULTURAL PRODUCTION IN KENYA

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ABSTRACT.

The importance of credit in increasing agricultural productivity has been emphasised by many economists and writers, internationally. Economists and policy makers generally support the great need for agricultural credit of appropriate quality and quantity, granted under appropriate terms. It is argued that in developing countries credit is required to increase farm output and also as a basic ingredient to initiate balanced economic growth, while some people stress its significance in breaking the vicious circle of low capital formation and the subsequent low productivity.

The credit creed notwithstanding, past experience reveals problems with credit supply, use and repayment. The paper reassesses the role of institutional credit in smallholder agriculture in Kenya. It is shown that the demand for and supply of credit, use of loan funds and repayment performance are not strictly responsive to agricultural production, and that loan users are generally not better off in factor productivity than non-loan users. These findings are important for formulating credit policies.

INTRODUCTION

The importance of credit in increasing agricultural productivity has been emphasised by many economists and writers. At the 1970 International Conference of Agricultural Economists, in the USSR, the great need for agricultural credit of appropriate quality and quantity, granted under appropriate terms, was universally supported. It was also noted that in the developing countries, credit is required to increase farm output, and also as a basic ingredient to initiate balanced economic growth. It was further noted at this conference that in free market economies where adequate credit is not provided either by subsidisation or institutionalised financial channels, many lenders thrive on exorbitant interest rates (Aines, 1970). Gyekye *et al* (1977) stress that injection of credit into the system would break the vicious circle of low incomes brought about by low capital formation and subsequent low productivity.

The problem of low capital formation in the development process has probably received more attention than any other factor. Earlier theories presuppose that lack of credit is the cause of underdevelopment. In the mid-1970s, credit was the largest component in the World Bank's agricultural lending (World Bank, 1975). Jones (1971), however, contends that capital should not be considered the primary determinant of economic development but that its importance in increasing production and per capita income cannot be disregarded. Increase in

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agricultural output per unit of land would require increases in the use of labour and/or capital. For example, the use of fertiliser, and hired labour where family labour is not adequate could enhance production and productivity. Where the increases in labour and capital cannot be supported by the systems with low capital formation, an injection from outside becomes a necessity.

The credit creed, for the small farmer in particular, has gained support from many economists. Falcon *et al* (1987) argue that good credit arrangements with effective loan administration can result in high returns to smallholders in the short term and will be a key element in any package of smallholder assistance. Credit to purchase inputs and to meet other operational costs and arrangements is considered crucial for small and marginal farmers, many of whom are not in a position to cultivate even the small plots of land that they own because the initial investment is beyond their means. Failure to develop credit mechanisms that benefit small and medium sized farmers is seen by many observers in contemporary Africa as a handicap to agricultural development. The credit creed is universal and one agreed requirement for it is an effective organisational structure.

THE DEVELOPMENT OF AGRICULTURAL CREDIT IN KENYA.

Public involvement in agricultural credit in Kenya started way back in 1931 with the establishment of the Land and Agriculture Bank, vide the Land and Agriculture Bank Ordinance of that year (Ordinance No 3 of 1931). The bank mainly provided long term credit meant for ensuring continued supply of raw materials and food. Initially it was not given to African farmers but later it was extended to them with restrictions which made it difficult to obtain:-

> *Advances may be made to natives but no such advance shall be made without consent of the Local Native Council concerned, if the applicant for such advance is a farmer within a native reserve (Ordinance No 3 of 1931, para 26).*

This position was maintained until 1963 when the amendment of the Land and Agricultural Bank Ordinance was passed and the Agricultural Finance Corporation (AFC) formed to work alongside the bank. The title of the ordinance was later changed to the Agricultural Credit Act.

Subsequent experience caused the repeal of the Agricultural Credit Act, and the enactment of the Agricultural Finance Corporation Act in 1969, which saw the amalgamation of the AFC with the Land and Agriculture Bank, dissolving the powers of the latter. The government's intention was to create a corporation that would assist African farmers who were moving into large scale farming and also to promote higher production for the smallholder areas.

The government's involvement on agricultural credit has remained dynamic as may be observed from every national development plan. In her first national development plan period (1966-70), the country embarked on an expansion of public credit to smallholder agriculture principally to stimulate output of dairying, beef cattle, cotton, groundnuts, hybrid maize, beans, pineapples and potatoes. This remained so with the second plan period (1970-

74) although it was envisaged that in the long run public credit institutions would become less important as private credit organisations became better developed.

The third development plan (1974-78) saw an expansion of agricultural credit programmes as a tool to promote the development and intensification of agricultural production and to assist in the transfer of expatriate occupied farms to Kenyans. The fourth (1979-83), fifth (1984-88) and sixth (1989-93) plans focused some attention on the means to expand agricultural credit. It was during the fifth plan period that the Central Bank directed that commercial banks and non-bank financial institutions allocate, respectively, not less than 17 percent and 10 percent of their total deposit liabilities to agriculture.

With the backing from government policy, Kenya's agricultural credit system has undergone a lot of development over the years. Earlier studies in the field of credit examined some of the issues underlying smallholder credit in Kenya against available evidence, and these were used as a basis for recommending a reconsideration of smallholder credit policy (Heyer, 1973). The major issues that received attention were whether credit was crucial in smallholder development, whether smallholder credit should be provided on commercial terms, on subsidised terms or both, and what institutional arrangement would be most effective in meeting the needs. It was argued that smallholder credit programmes should be considered in their macroeconomic context, that provision of credit on commercial terms should be encouraged alongside subsidised credit, that provision of subsidised credit should be with specific purposes in mind and finally that credit should be provided on a limited scale for those purposes only. It was also argued that alternative measures should be used for encouraging smallholder production, and that thought should be given to the possibility of developing a national smallholder credit structure that goes right down to the local community. Such local institutions were expected to use their substantial comparative advantage in performing some of the functions necessary.

Kenya has adopted all these recommendations in one way or another in her credit policy. For instance, the Seasonal Credit scheme administered by the Agricultural Finance Corporation is a form of subsidised credit for the purposes of food production only; provision of credit on commercial terms is encouraged by the Central Bank's directive that commercial banks allocate not less than 17 percent (now 20 percent) of their total deposit liabilities to agriculture, and non-bank financial institutions to allocate 10 percent (now 15 percent). The recent establishment of Union Banking sections within the co-operative movement is a case of smallholder credit structure that goes right down to the local community.

In one of Kenya's most recent policy papers, agriculture and livestock credit policy is given a comprehensive coverage (GOK, 1993)[1] . Food security and food self sufficiency is the central objective, which recognises credit as a means, among others, to achieve an end. It is noted that agriculture contributes nearly 30 percent of the nation's GDP and more than 60 percent of her total export earnings and yet it receives only 10 percent of the total credit extended to the economy. Expansion of seasonal and long term credit programmes is envisaged while at the same time addressing the problems noted in past experiences.

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1 GOK - Government of Kenya.

It has all along been assumed that credit is a general constraint in the bulk of Kenyan agriculture, and indeed in most less developed countries, although a few scholars have their reservations. For instance, Von Pischke (1973) observes that lack of credit facilities may not be a major constraint to development and that credit should be viewed within a broad context of any event. That is, there should be a specific constraint-oriented strategy for credit supply. Most co-operative credit programmes, like the Co-operative Production Credit Scheme (CPCS), operational in co-operative societies in the country for various enterprises, have been handled within the broad context of developing those respective enterprises.

While reviewing experiences with small farm credit in Kenya, Vasthoff (1968) attempted to quantify the economic effect of credit on the basis of a survey of 108 farms. The findings were that credit assistance to smallholders yield good return on invested capital and may contribute positively to borrowers' income. The potential contributions of credit have not, however, been achieved due to various administrative and legal constraints.

Abuki (1977) investigated the structure of the various institutions supplying agricultural credit and attempted to investigate the legal regime providing for administration, regulation and implementation policy and whether such law provided suitable machinery for that role. His findings were that the lending institutions were inadequate and their management insufficient and therefore not of much help to the farmer. He further noted that low creditworthiness, the dominance of illiteracy and ignorance of both the law and other development factors, and the existence of colonial laws render smallholder credit facilities of marginal value to the peasants. Indeed the aura around credit institutions and credit programmes has been filled with reservations and reluctance to address the smallholders.

THE PROBLEM.

The Kenya government has over the years invested substantial amounts of resources in the administration and implementation of credit programmes and projects for smallholders but there is little evidence that there has been a significant impact on agricultural productivity. Various studies have shown that productivity in Kenya has stagnated and that this may have been a result of low use of technologies (Kimenye, 1984; Block, 1992; Njue and Fox 1993; Okello 1994). The low use of technologies are due to the low capital formation and lack of credit or misuse of it among smallholders who constitute the bulk of farmers in Kenya.

Many institutions exist which supply agricultural credit and have been operating over the years. A number of shortcomings have been noted with credit supply and demand, use of loan funds, repayment performance and impact of credit. Past evaluation studies have tended to confine their analyses to specific and isolated aspects such as repayment performance or the credit institutions (Von Pischke, 1974; Abuki, 1977; Otiato, 1978; Gachanja, 1979).

The objective of this paper is to investigate credit supply and demand, use of loan funds, repayment performance and the role of credit in increasing factor productivity. The analysis is based on the information and data provided by a survey of Kisii[2] district by Nyikal (1990).

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[2] Kisii district has since been divided into two, Kisii and Nyamira.

METHODOLOGY.

Analytical Tools.

The variables investigated in the study were factors affecting the demand for credit; factors related to the actual amounts of loan funds applied for (demand) or supplied; how credit funds were utilised in the past; repayment performance and the factors related to it; and the role of credit in relation to farm productivity.

Descriptive statistics were used to explain factors affecting the demand for credit. Simple correlation analysis was then used to investigate the factors related to the actual amounts of loan demanded or supplied.

The measure of correlation was the Pearson product-moment correlation coefficient, r.

$$r \equiv \frac{1}{n-1}\sum_{i=1}^{n}\left(\frac{X_i-\overline{X}}{S_x}\right)\left(\frac{Y_i-\overline{Y}}{S_y}\right)$$

Where, r is the sample correlation X and Y are two variables whose linear relationship is under investigation e.g. loan size (X) and value of security (Y).

S_x and S_y are the standard deviations of X and Y, respectively.

It is a parametric measure which assumes that the scores are from a bivariate normal population. The sample correlation coefficients between the amounts of loan obtained (supply) or applied for (demand) and various relevant factors were obtained. The corresponding population correlations were inferred from them using 95 percent confidence bands for correlation, for various sample sizes (Wonnacott and Wonnacott, 1979).

Descriptive statistics were applied to explain how credit funds were utilised in the past, i.e. the levels of correct application, partial misapplication and total misapplication. For credit repayment, the performance was defined and various factors that affect it examined, for both AFC and co-operative loans.

The methodology used in defining repayment performance (RP) is a snapshot measure, i.e.

$$RP = \left(\frac{Amount\ repaid}{amount\ repaid\ +\ amount\ due}\right)x100\%$$

The snapshot measure was taken when lack of systematic data could not allow for period by period evaluation.

Correlation analysis was also applied to determine the factors that were related to repayment performance. The factors investigated were loan size, level of output after loan, family size and non-farm income. Repayment performance here serves as a proxy to lender performance.

The role of credit was examined in relation to farm productivity by comparing the average physical products (APP) or average value products (AVP) of the factor inputs between loan users and non-loan users. This, in essence, is comparison of technical efficiencies of factor inputs between the two groups of farms. A production function was not estimated, nor would a regression analysis be suitable since there was no basis for choice of functional form (Turvey and Deboer, 1988). Furthermore, distortions of the costs of land and family labour rendered analysis of efficiency using marginal productivities futile (Nyikal, 1990).

The Mann-Whitney U-Test, a non-parametric test, was used to compare the average productivities of land, operating capital and family labour between loan users and non-loan users. A non-parametric measure was chosen since its model does not specify conditions about the parameters of the population from which the sample is drawn (Siegel, 1956). Such conditions would include independence of observations and normally distributed and homoscedastic populations. The test requires that the sizes of the two independent samples being compared be different. Since some loan users in the initial sample were either not available or did not cooperate, the sizes of independent samples ended up being different as required. For AFC loan users and their control, the average value products of land, operating capital and family labour in whole farm production were investigated. For co-operative society loanees and their control, the average physical products of the same factor inputs in coffee production were investigated.

The Study Area and Data.

Kisii is basically a smallholder agricultural district. It has high potential for agricultural production as favoured by its climatic conditions but the population density is also quite high, one of the highest in Kenya. Extrapolation at 4 percent per annum, of the 1979 census figure of 869,512 persons, gives the current (1994) population of the district as 1.5 million with an average density of 700 persons per square kilometre.

The land-man ratios are declining and production is not keeping pace with consumption demands. The average yield of maize has remained 40 bags per hectare over the better part of the decade (MoA[3] , Annual Reports 1985-1988) and yet higher yields are possible (Acland, 1971). There is need to improve land productivity and resource utilisation to accommodate the population. Land productivity could be improved by introduction of modern technology, which itself requires an injection of capital. Many farms are characterised by a vicious circle of low capital formation and low productivity, hence the need for credit.

Agricultural credit in the district is supplied by the Agricultural Finance Corporation (AFC), the co-operative unions and societies, the commercial banks, the Kenya Tea Development Authority and some input suppliers. The conditions and terms of lending as well as the interest rate policies of the institutions are quite diverse. The commercial banks and the co-operative unions and societies do not only charge the highest nominal interest rates (currently up to 30 percent per annum) but also capitalise unpaid interest monthly or quarterly, thereby raising substantially the cost of borrowing.

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[3] MOA - Ministry of Agriculture.

For the purpose of food production, the Seasonal Credit Scheme exists but is particularly biased against farmers in Kisii district. One major requirement is that at least 5 acres must be made available for food production under the scheme whereas the average farm size is less than this (MoA Kenya, 1979). As a result, only an average of 0.5 percent of the total staple food (maize) production in the district was financed in the past decade by the AFC (Nyikal, 1990).

The survey method applied in this study consisted of general discussions and administration of questionnaires with relevant respondents who included government agencies, lending institutions, loan users and two control groups of non-loan users. Two lending institutions, the AFC and a co-operative society, were chosen due to their closer association with the district's farming activities as compared to the other institutions.

EMPIRICAL RESULTS.

From the response of non-loan users, it may be deduced that there is lack of effective demand for loan funds in Kisii agriculture. "Effective demand" here refers to a situation where there is need for loans due to lack of capital and farmers are willing and able to acquire funds at stipulated conditions. A summary of the reasons for non-use of credit among sampled farmers is presented in Table 1.

Table 1: Reasons for non use of Credit Among Sampled Farmers in Kisii District 1989.

Reasons for non-use of credit.	No. of respondents.
1. Not creditworthy, i.e. applied but did not obtain.	10
2. No need for credit, i.e. financially able or have no plans to warrant borrowing.	31
3. Application procedures and requirements for creditworthiness limiting.	15
4. Fear consequences of inability to repay.	7
5. High interest rates	6
6. Amounts given usually too little to to cause any reasonable effect.	4
7. Indebted elsewhere	2
8. Against supervised credit i.e. would. prefer credit in cash not in kind.	2
TOTAL	77

Source: Nyikal, 1990.

In the analysis of factors related to the actual amounts of loan applied for (demand) or approved (supply), various factors which were expected to be relevant were listed for correlation analysis. For co-operative credit, it was expected that the amount of loan applied for and that obtained would have significant negative correlation with three-year average production prior to loan, and also significant positive correlation with family size.

The results were:

(I) Loan demand had significant correlation with production prior to loan (0.54 at 0.001 significance level)

(ii) The other variables were not significant. From these results and the impression obtained during the general interviews, it was apparent that both farmers and lending institutions were more concerned with "current material" than with the expected production after loan thus implying high risk aversion.

(iii) Loan supply had positive correlation with demand (0.69 at 0.001 significance level) and past production (0.54 at 0.001 level) but not with expected production.

For AFC loans, the factors that were expected to have some correlation with actual quantities demanded or supplied were expected farm income at maturity of loan; total expected income at maturity of loan; non-farm income; family size; and value of security.

None of the listed factors had any significant correlation with actual amounts demanded, indicating that loan demand did not have a definite basis, and confirming further that there was lack of effective demand for loans in Kisii agriculture. The actual amounts approved (supply), however, had significant correlations with value of security (0.55); amount applied for (0.45); total expected income at maturity of loan (0.42); and (all at 0.01 significance levels).

Use of loan funds and repayment performance were not impressive either. Despite the credit being disbursed in kind and in instalments, there were still several cases of misappropriation. Many respondents did not admit misappropriation of funds; they claimed they had actually meant the funds for the purposes in which they put them rather than what was in the agreement. A more significant point for this group was that the repayment was on schedule. The ease with which such funds could be obtained and the relatively lower interest rates had provided grounds for the malpractice.

Repayment performance was estimated to be about 39 percent for co-operative and about 45 percent for AFC loans. An attempt to examine the factors that may be related to repayment was made in the following ways:-

i) comparing mean repayment performance under various modes of repayment;
ii) comparing mean repayment under various modes of application of loan funds; and
iii) correlating performance with various theoretically plausible factors.

For both the two lenders, mode of repayment did not seem to influence repayment performance, and neither did it relate to misapplication of loan funds. Various modes of application of loan funds, however, had some significant implication only for AFC loans. Cases of correct application and those of total misuse of funds exhibited higher repayment performance than those with partial misapplication. The former unlike the latter had put the funds into some productive use. On examination of other theoretically sound variables, only loan size for co-operative credit had some significant correlation with repayment performance

(it was -0.57 at 0.001 significance level); there were more defaults with bigger loans. All other variables for both lenders were insignificant.

On the role of credit, it was expected that productivities of factor inputs of land, operating capital and family labour would be higher for loan users than for non-loan users; the vicious circle of low capital formation and low productivity was expected to have been broken by the loan funds. The results from the Mann-Whitney U Test indicated that loan users were not better off in factor productivity than non-loan users. The results are summarised in Table 2.

It had been observed that loan users tended to use higher levels of operating capital, but that this did not improve subsequent productivities of other factor inputs. In any case, there had been several cases of misapplication of loan funds. The efficacy of institutional credit to improve factor productivity in smallholder farming is therefore questioned.

Table 2: Comparing Mean Average Products of Factor Inputs between Loan Users and Non-Loan Users.

Factor	Loan Users	Non-loan Users
Mean APP land (100kg/ha.)	39.50	48.80
Mean APP oper. cap. (kg/sh.)	9.82	66.73
Mean APP family labour (kg/hour)	2.74	5.67
Mean AVP land (sh.1000/ha.)	12.60	12.00
Mean AVP oper. capital (sh/sh.)	4.05	8.15
Mean AVP family labour (sh/hr.)	11.50	9.90

APP = Average Physical Product AVP = Average Value Product

Source: Computed from Nyikal (1990).

CONCLUSIONS AND POLICY IMPLICATIONS

The conclusions arising from the analyses above are as follows:-

i) Agricultural loans are not available to the needy smallholders because the criteria for creditworthiness include factors outside the expected production;

ii) Agricultural loans are highly subsidised but are not used for agricultural purposes due to the relatively low profitability of the sector.

iii) Lender performance, specifically liquidity position, is retarded by poor repayment performance, which incidentally, is not related to level of output, and which restricts further lending to other potential borrowers.

iv) Users of loan funds do not improve factor productivity in smallholder agriculture, because the funds are hardly used in that sector.

These are mutually reinforcing phenomena and the recommendations arising from them are:-

(i) The concept of creditworthiness should be redefined, to address needy smallholders. As it is now, creditworthiness means an availability of land and any other tangible deed, to offer as collateral.

(ii) Subsidised interest rates on agricultural credit should be discontinued to prevent loan abuse, and consequently policies to improve the relative profitability of the sector should be instituted. Such policies would normally address timely supply of inputs, effective extension services and timely payment for farmers' produce.

The issue at stake is to establish a system which will generously extend credit to needy smallholders at effective interest rates, and which will ensure correct application of loan funds and enhance acceptable loan repayment performance. All the sociological and political factors that have so far contributed to loan delinquencies at all levels have to be addressed as they seem to surpass strict economic factors.

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3.3

EVOLUTION OF FERTILISER POLICY AND MARKETING IN KENYA: THE SEARCH FOR EFFECTIVE FERTILISER DISTRIBUTION & USE

W. Oluoch-Kosura[a] and D. Chege [b]

INTRODUCTION

Kenya's economy is dominated by agriculture. Agricultural sector supplies food for the rapidly growing population, and is a source of employment for over 70% of the population. The sector contributes about 30% of the Gross Domestic Product, approximately 64% of the export earnings and also provides the raw materials for the agro-based industries. Given this pivotal role in the economy, the government is committed to support the sector with the aim of increasing its productivity and sustained growth (Kenya, 1986).

Three sources of growth in agriculture have been identified in Kenya (World Bank, 1987). These include crop area expansion, commodity switching/substitution as relative prices change and intensification. Of Kenya's 5.2 million hectares devoted to farming, only about 20% is considered high - medium potential arable land. With a population of about 23 million and growing at between 3.5 - 3.8 % per annum, the emergence of scarcity of arable land for the farming population becomes increasingly evident and dependence on area expansion as a source of growth diminishes. The commodity substitution avenue as a source of growth was heavily exploited soon after political independence in 1963 when the smallholder farmers were permitted to engage in enterprises which hitherto were forbidden by the colonialists for various reasons. Their participation in the growing of cash crops such as coffee, tea and pyrethrum since independence enabled them to contribute over 50 % of the agricultural exports by 1970s. By 1992 small farms contributed over 60% of market share of farm output.

Further expansion in participation of the smallholder farmers in the commercialisation of agricultural sector is facilitated through attempts to improve marketing of the farm inputs and products. The third source of growth which is intensification of farming on existing arable land currently shows the greatest promise in achieving the needed growth to achieve the development goals. Intensification of farming leads to obtaining higher output per given unit of land. This is achievable through adoption of better crop husbandry practices such as timely planting, optimum spacing, proper weeding and pest management, in addition to improved technology involving use of high-yielding varieties and application of appropriate fertilisers. Organic farming which emphasises the use of natural manure and other chemicals in farming is a recent advent in Kenya which needs further exploration and development.

This paper focuses on the policies of the Kenya government on chemical fertilisers. It highlights the economic basis for use of the fertilisers, the evolution of fertiliser use and the

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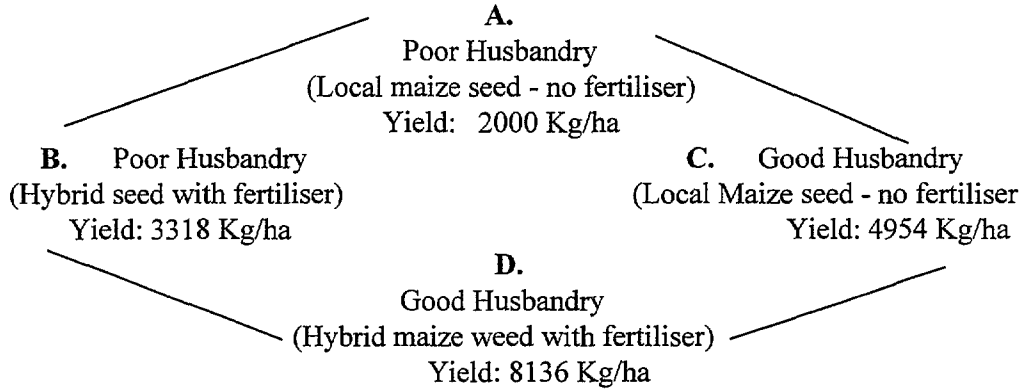
various marketing and pricing policies that have been pursued by government in attempting to promote its use before and after liberalisation of fertiliser market. The paper ends with the recommendation that if the government improves the infrastructure and enforces quality control, private trading in fertiliser will facilitate greater use of fertiliser and achievement of higher yields of crops.

CHEMICAL FERTILISERS AND THEIR USE IN KENYA

Chemical fertilisers can be categorised into three types. These include straight fertilisers, compounds and mixes. Straight fertilisers contain only one of the three main nutrients provided by fertilisers i.e. nitrogen, phosphorus[1] or potassium[2](NPK). Compounds are obtained by a chemical reaction resulting into products containing more than one of the three nutrients of the NPK. Mixes contain more than one of the NPKs but are the result of physical blending of fertilisers. The fertilisers commonly used in Kenya together with their nutrient analyses is in Appendix 1[1/].

About 60% of the total fertiliser used in Kenya is reported to be used on three major cash crops (coffee, tea and sugar), Kenya, (1986)). A further 26% is used for maize and wheat, leaving only 14% for all other crops. About 58% of fertiliser consumption is on estates and large farms with 42% on smallholder farms. Of the consumption by small farms, 29% is on coffee, 21% is on maize, 20% on sugar and 15% on tea. Of the total nutrient use, approximately 50% is nitrogen, 44% is phosphate and 5% is potash. Most soils in Kenya are reported to be sufficient in potash. Potash is used mainly on tea, coffee and tobacco. In the pioneering agronomic experiments on maize yield response to fertiliser, Allan (1968) emphasised, using the now familiar "Maize Diamonds" that good crop husbandry by farmers should precede intense application of fertiliser. This is illustrated in Figure 1.

Figure 1: Maize Diamonds



Source: Allan, 1968. Quoted in Oluoch-Kosura (1983)

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1. Phosphorus is usually reported as phosphorus Pentoxide (P_2O_5)
2. Potassium is usually reported as Potassium Oxide (K_2O).

Chemical fertiliser use is one of the most effective ways of increasing land productivity. Without the use of appropriate fertiliser, farmers practicing good husbandry cannot realise the full potential of the available high-yielding seed varieties.

Government Policy On Fertiliser

As stated in Sessional Paper No. 1 of 1986, increasing national agricultural production must rely on intensification of land use through both switching of land to high value crops and through increasing the yields of the crops planted. Both means of intensification require an increase in the fertiliser used per hectare. Two conditions are considered necessary to achieve the aim:

(i) sufficient quantities of fertiliser of the correct types must be available at the right time.
(ii) the fertiliser must be available for farmers to purchase at outlets close to their farms and in appropriately sized packages.

These conditions have not been met as is evidenced by the following realities. First, wide variations in fertiliser use per hectare exist from one part of the country to another. For instance, trends in the past indicate that smallholders in Muranga district apply 26 times the fertiliser to their coffee compared to their counterparts in Meru in a similar agro-ecological zone. The smallholder tea growers in Central Province apply two to three times the amount of fertiliser compared to the tea farms in Rift Valley, Western and Nyanza Provinces(Kenya, 1986). Secondly, wide gaps exist between the recommended levels of fertiliser application to the actual levels applied by farmers for various crops.

The constraints to the fertiliser use by farmers may be explained by demand and supply factors. These factors are the ones that influence the government in the formulation of the policies over time.

Demand Factors Constraining Fertiliser Use

Among the important factors to consider in this category are technical and financial aspects of fertilise use. In many cases, farmers lack awareness of the fertilise use. They may not know the appropriate type, the level and procedure of application. This is brought about by weak extension service or lack of relevant agronomic or economic research. In effect, farmers lack useful fertiliser information for their crops. In other cases, the subsistence nature of production force the farmers to rely on conventional production methods which involve non-purchase of farm inputs. The level of crop husbandry may be such that adoption of fertiliser will itself be risky. Moreover, the drudgery involved in the search for fertiliser may be perceived as not worth the effort and this may be warranted if the nutrient contents of the fertiliser is low. In other cases where women are the production decision makers, they may be by-passed by the messages promoting fertiliser use.

The demand for fertiliser is also influenced by lack of financial incentives. These include unattractive returns due to high cost of fertiliser relative to the unit crop output price.

For example in 1992 the general prices received for agricultural output rose by 18%. Over the same period the general index of prices paid rose by 23.1% (Kenya, 1993).

The unattractive returns may also be due to marketing problems, uneconomic research recommendations, high perceived risk or lack of capital (own savings or credit) to enable the initial purchase of the fertiliser. Moreover, when farmers are paid late for their produce they are handicapped in accessing the fertiliser during the planting season.

Supply Side Factors Constraining Fertiliser Use

Kenya currently imports almost all its requirements of fertiliser since there is no domestic production[1]. The imports are obtained from commercial sources in the world market or in the form of aid mainly from USA, Gulf States, Europe, the Middle East and other parts of Asia. The constraints related to supply therefore include late arrivals for fertiliser, inadequate supply channels, large packages relative to what smallholders need, transport problems, lack of promotion and low margins for fertiliser stockists or retailers. The move to liberalise the fertiliser market is aimed at solving these supply - side problems, especially if the government develops the infrastructure and supplies market information[1].

NATIONAL FERTILISER CONSUMPTION AND SUPPLY TRENDS

Consumption

The use of chemical fertiliser dates back to the early 1920s. However, by 1963, the usage was largely confined to large-scale commercial farms. With the introduction of cash-crop production to the small scale farms and the availability of high-yielding varieties of maize seed, smallholders increasingly adopted fertiliser use. While by 1963 only 38,000 tons of fertiliser was used, in the 1980s over 200,000 tons was being used annually. There was a rapid growth between 1963 to 1971 when there was increased demand from the small scale sector, a subsidy by the government and stable world fertiliser prices (Allgood, *et al.*, 1990). After 1971, fertiliser application slackened due to high international fertiliser prices following the oil crisis, a general collapse of the world agricultural product prices, increased local transport costs, and gradual phasing out of the fertiliser subsidy. Thus, between 1971 -1993, the rate of increase in fertiliser use was only 2.5% per annum as compared to 7.5% per annum between 1963 - 1971.

During the 1983 - 1991 years, fertiliser use increased at a high rate of 10.4% per annum. Table 1 shows the quantity of fertiliser used between 1980/81 and 1992/93 and the annual rates of increase. Seemingly, there was a big drop in consumption of about 22% between 1988/89 and 1990/91. This drop could be explained by (1) low coffee prices, (2) late payment to farmers for their cash crops (3) shortage of foreign exchange to import the

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1 Some single super phosphate (SSP) fertilizer is produced by KEL Chemicals Ltd. at Thika which produces 10 000 tonnes per year though it has a capacity of 40 000 tonnes per year. Mea Ltd. activity is confined to bulk blending and bagging of imported fertilizer.

fertilisers, (4) the freeing of fertiliser price controls (5) the upward adjustment of fuel prices (6) late arrival of fertiliser at the farm level. These reasons influenced the liberalisation of the fertiliser market by government. We witness a slight increase of fertiliser use after 1990/91 but the levels are about 4% below the 1988/89 levels when the greatest amount of fertiliser was used in the last decade.

Table 1: Fertiliser Use in Kenya - 1980 - 1990/91

Year	Qty Used	% Change ('000 MT.)
1980	129	
1981/82	136	5.4
1982/83	143	5.2
1983/84	198	38.5
1984/85	175	-11.6
1985/86	272	55.4
1986/87	227	-16.5
1987/88	238	4.9
1988/89	285	19.8
1989/90	237	-16.8
1990/91	221	6.7
1992/92	248	12.2
1992/93	273	8.3

Source: Allgood *et al.*, 1990 and MOA Reports

Although the national usage can be derived from the available imported supplies, the real demand is difficult to determine. Over the years 1990 - 1993 imports were in the range of 196,000 to 244 000 tonnes while estimated consumption ranged between 237,000 and 273000 tonnes. Current annual consumption is considerably below the level required for a growing agricultural sector, estimated at 400 000 tonnes (Kenya, 1993). Shortages frequently exist for one type or in one place or another.

Even when supplies are considered adequate, not all trading centres obtain the supplies. At the same time late payments to farmers for their produce continue to make them unable to plan fertiliser purchases and application as would be desired. Various forecasts for the demand for fertiliser by the year 2000 range from 270,000 tonnes to 931,200 tonnes[1] (Allgood, *et al.*, 1990). It is to be recalled that the actual level of demand will depend on crop husbandry practices, climate, crop prices, timeliness in payments, world fertiliser prices, local availability as well as other demand factors already highlighted. With the liberalisation of the product markets, the issue of delayed payments to farmers will hopefully be eliminated.

Supply Trends

As indicated already, almost all fertilisers used in the country are imported either commercially or through donor assistance[2]. Before liberalising the fertiliser market and

removal of price controls in 1989, the government prepared an annual fertiliser import plan indicating estimated national requirements, carryover stocks from the previous year, donor pledges and quantities and types available for commercial importation. Import quota allocations were given to large end users such as the large estates, parastatals, private and co-operative distributors who applied for import quotas. These supplies hardly reached the smallholder farmers.

Trends in aid-fertiliser and commercial fertiliser imports are shown in Table 2. Since the 1987/88 it is evident that aid fertiliser has been forming a big proportion of the available fertiliser in Kenya but this proportion has been falling. The lowest proportion of aid fertiliser was realised in 1991/92 when aid agencies curtailed their support to Kenya. This declining trend in aid fertiliser has meant less fertiliser available for farmers.

The major fertiliser product types which have been imported in the country from 1983/84 to 1993/94 is summarised in Table 3. The compound and ammonia phosphate fertilisers are the dominant fertilisers types, accounting for over 70% of the total fertiliser imports[1].

Table 2: Fertiliser Imports into Kenya

Type	1987/88	88/89	89/90	90/91	91/92	92/93	93/94
Commercial	82,950	126,077	99,371	116,550	189,965	143,316	166,000
AID	142,310	172,640	111,517	106,912	54,100	109,000	107,000
TOTAL	222,260	298,717	210,888	223,462	244,065	252,316	273,000
AID AS %	63%	58%	53%	48%	22%	43%	39%

Source: MOA Records

1. The higher level of forecast is expected to supply about 372,000 metric tonnes of nutrients. A linear trend estimate forecasts the demand at 575,000 tonnes of fertilizer by the year 2000 (Gitu, K. Personal Communication).

2. The exception is SSP which is produced at Thika.

Table 3: Summary of Fertiliser Imports (Tons): 1983/84 - 1993/94

Type	83/84	84/85	85/86	86/87	87/88	88/89	89/90	90/91	91/92	92/93	93/94
DAP	40754	48000	67538	63500	76689	81351	80576	73343	83654	71755	102000
MAP	16045	0	8500	1000	3584	2532	4111	8367	5000	11812	27000
TSP	12562	4000	15900	8000	5784	6352	2832	6921	4500	3000	10000
NPK:20:20:0	24700	19750	45349	18000	27558	22580	12065	9971	2000	4000	-
SSP	0	3000	7000	4000	2505	28	43	39	0	-	-
SA	14426	22974	1294	3000	3567	12197	1826	2450	0	4000	54000
CAN	44506	27000	40700	48000	30724	39449	36188	21792	24000	36440	-
ASN	8791	95000	11200	8400	4010	11726	16735	10882	7000	5000	5000
UREA	5494	15600	38500	8750	13691	16377	5652	18779	21103	10921	40000
NPK 25:5:515%S	22098	25500	44000	36175	37884	51675	51622	41373	53400	52300	30000
NPK 20:10:10	901	19000	40500	23000	15311	12373	13952	23237	8500	2664	-
NPK 17:17:17	0	4100	6440	4500	5118	5498	1345	4855	0	11022	-
NPK 23:23:0	0	0	0	0	0	1740	4340	1932	20000	22202	-
NPK 15:15:6 + 4MgO	0	1600	0	1500	1500	1000	0	1800	480	-	-
NPK 6:18:20 + MgO	0	2000	0	-	-	-	-	-	0	-	2000
MOP & SOP	1368	3600	4100	1040	3868	3102	2075	736	890	222	-
OTHERS	1843	800	2420	0	5080	1551	2000	230	5538	10536	-
TOTAL	13308	291924	333441	229865	237873	271531	237362	227707	-244065	247816	273000

Source: MOA Various Reports

FERTILISER MARKETING AND PRICING

Fertiliser Marketing

The government's concern to promote fertiliser use by farmers has compelled it to be making frequent changes in the structure and conduct of the fertiliser markets since independence. Prior to 1970 fertiliser was used mainly by large scale farmers and distribution was dominated by the then Kenya Farmers Association (KFA)[1]. Competing with KFA were other fertiliser dealers comprising of locally incorporated private companies in Europe. The companies were either agents of overseas fertiliser manufacturers, such as Albatross, BASF and Hoechst, or subsidiaries of multinationals such as Imperial Chemical Industries (ICL) - now Twiga Chemicals). The KFA along with these other companies acted like a cartel, making all recommendations relating to fertiliser imports, types and pricing for approval by government through the Fertiliser Advisory committee. The government's main role to was confined to payment of recommended subsidies, research and extension.

Recognising the continued limited use of fertiliser and other purchased inputs by smallholders, the government set a commission to review the whole area of agricultural inputs use in Kenya in 1970[1]. The commission made several recommendations including the following:

(a) allow any firm to import and distribute fertiliser in order to maintain a healthy competitive environment;
(b) reform the pricing structure on the basis of a mark-up determined by the c.i.f. price;
(c) encourage local traders to provide competition to co-operatives;
(d) improve transport services; and
(e) make small bags of fertilisers available to smallholders.

Not all of the recommendations were implemented immediately but they have remained relevant and have influenced the government in the fertiliser reform program.

Following the 1970s increases in oil prices, the prices of fertilisers as well as freight and in country distribution costs of the commodity increased dramatically. The government therefore felt obliged to institute price control, import regulations, and setting of marketing margins and retail prices. In fact, the government was directly involved in importing about 174,000 tonnes of fertiliser in 1974 but could not continue in subsequent years. The changes in official policy governing fertiliser marketing have always had good intentions including encouragement of fertiliser use among smallholders, and promoting local businesses.

However, the effects are often opposite. Rather than opening up the market and increasing competition, fertiliser import regulation, coupled with pricing and monopoly policies in the past have driven the more experienced firms out of the market. Most of the firms did not have distribution systems to serve smallholders, nor the experience and capital to assure timely imports. Fertiliser imports have often been delayed as some firms did not take up their allocations and others could not finance imports.

The current fertiliser marketing system emerged in 1984 when it was decided that greater private sector involvement in the fertiliser importation and distribution should be encouraged to improve fertiliser availability on farms. Prior to 1984, aid fertiliser distribution was dominated by KFA/KGGCU. The donors, with United States Agency for International Development (USAID) which supplies about 70% of the aid fertiliser insisted that the monopoly given to KGGCU should be broken.

Aid fertiliser is allocated to private sector dealers including the co-operatives through successful application/bidding. The successful applicants obtain the allocation upon presentation of a bank guarantee for purchase.

Fertiliser obtained from commercial sources were imported through issuing of import licenses to capable firms before abolishing import licensing. This practice was meant to conserve foreign exchange as well as increasing the number of firms involved in marketing fertiliser in Kenya[1]. Applications for license were reviewed and approved by the Fertiliser Advisory Committee which included the Ministry of Agriculture, Finance, Co-operatives and Office of the President. The Committee approved the licenses based on the estimated requirement and donor pledges for each type of fertilisers. In theory importers with experience and having good distribution network in the rural areas were given priority in obtaining fertiliser import licence. The marketing functions performed at different levels by various institutions are summarised in Table 4. The government through the various research establishments determined the appropriateness of various fertilisers to be imported. Large scale and users with special needs also sought approval from the government to import their requirements. It is to be noted that pricing function (discussed in the next section) until December 1989 was performed by the price controller in the Ministry of Finance but after price decontrol, local fertiliser prices are now determined by supply and demand[1] .

In the past, fertilisers have been packaged in 50 Kg unit bags. This unit package has been clearly a hindrance to small farmers who may need smaller quantities of fertiliser for their gardens or fields. One of the desirable changes in the fertiliser packaging would be to encourage small packages of 25 kg units or 10 kg units. This change can easily be adopted by private traders if there is effective demand for such fertiliser packages.

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[1] Increasing the number of firms was expected to promote competition but this was not always automatic.

Table 4: Marketing Functions Performed by Different Organisations

Functions	Responsibility	Comments
Produce		
(a) Type (b) Quantity (c) Purchases	Government	Government determines appropriateness of fertilisers, and allocates to importers/distributors the quantity that may be imported. Purchases are handled by the importers/distributors
Price	Importers/Distributors and Retailers	Beginning January 1990 fertiliser prices were decontrolled and the marketing system determined prices*.
Distribution		
(a) Transportation (b) Warehousing	Importers/Distributors and Government	Distributors determine where fertilisers will be stored and sold in the market place. In special situations donor fertilisers are designated to selected distributors
Promotion		
(a) Educational Prg. (b) Leaflets (c) Advertising	Distributors/Retailers and Government	

* Prior to the decontrol of fertiliser prices, the GOK determined the maximum fertiliser retail price. In actual practice the distributors were free to sell below the maximum price; however, it was not a wide-scale practice.

Source:Adapted from Algood *et al* (1990).

Fertiliser Pricing

The government has been very keen to monitor the level of fertiliser prices with an aim to keep them low so that farmers can afford the input. The government went as far as instituting a subsidy on fertiliser purchases early in 1970s. This subsidy could not be sustained and was removed. From 1974 to December 1989 the government exercised price control on the prices of fertiliser by fixing the ceiling price (Maximum Retail Price) to encourage fertiliser consumption as well as protecting the farmers from possible exploitation by traders. The fixed retail prices were gazetted by the government for each district headquarters and retailers were free to sell below the set price in their regions of operation. Although adding a reasonable transport charge to outlying areas of each district was technically permissible, it is reported that some retailers

got penalised for charging prices greater than the scheduled district headquarters price (World Bank, 1987). The tendency consequently discouraged fertiliser distribution away from the districts headquarters (rural areas) where the fertiliser was needed most.

Following the Havelock commission Report of 1972, the government adopted a cost-plus formula to fix the fertiliser prices for key market centres, usually district headquarters. This formula which was used until 1988 was of the following form:

C* 1.30 + 100 + T = Maximum Retail Price

where:

C = CIF Mombasa Cost per tonne
1.30 = factor to allow a 30% margin of CIF cost
100 = fixed margin of Kshs. 100 to cover port charges
T = transport allowance from Mombasa to the various market centres (District headquarters in most cases)

Although seemingly simple to use, the number of calculations required for each of numerous consignments with different CIF values continued to be cumbersome. Moreover, how 30% and Ksh. 100 margins were determined remained unclear. The government therefore replaced the above formula in 1988/89 with a more elaborate but logical formula for fixing fertiliser ceiling prices. The formula took into account the average CIF Mombasa cost (called the benchmark international price: BIP) plus the identifiable distributional costs up to the market centres.

However, even with this method, BIP was difficult to establish because of the fluctuating world market prices. Similarly, the distribution of the fertiliser to the rural areas was not ensured, because the gazetted prices were for the market centres.

As part of the fertiliser reform program influenced by donor pressure, the government decontrolled the domestic fertiliser prices in December 1989 but retained its role of regulating imports. It was speculated that the distributors would increase their fertiliser prices dramatically but at the same time have the financial incentive to expand their network to farm areas where fertiliser had hitherto not reached, and therefore avail the fertiliser to the potential users.

However, several occurrences soon after the decontrol prevented the speculative ideas from being experienced (Allgood, et al, 1990). First, the government and KGGCU decided to reduce the held excess stock levels. This action temporarily reduced the price of fertiliser by about 18%. KGGCU being a major distributor and therefore leader made other distributors contend with the low margin price levels after the reduced KGGCU set price. There was little financial incentive to expand the network as expected.

Secondly, soon after the decontrol, coffee world prices were depressed. For instance in 1990, the coffee growers received only about Kshs. 39,0000 per tonne of coffee compared to Kshs. 60,000 per tonne in 1988. Consequently, fertiliser sales to the coffee sector dramatically declined after the decontrol. Thirdly, since the decontrol of the fertiliser pricing there has been a rapid devaluation of the shilling relative to foreign currencies. This has resulted in very high domestic prices and the trend of declining fertiliser use is now in its fifth year (Kenya, 1993).

Imports are no longer subjected to import controls. Although in the long run this will allow private traders to import the fertiliser without inhibition, in the short run only firms with the ability to raise sufficient capital will import fertiliser, creating monopolistic tendencies. This calls for the government to facilitate farmers to organise themselves to get access to fertiliser to import from the world market.

The decontrol of fertiliser prices have given the retailers the flexibility to set prices which can give them sufficient margins. However, it is important to recall again that the demand for fertiliser by farmers is *controlled* by the *real* price of the products the fertiliser is helping in producing. If these product prices are controlled or their payments are delayed, the demand for fertiliser will drop and the increased production of such products may in the long run not be realised. It is therefore essential in policy to monitor the movements between decontrolled fertiliser prices and the prices of the products whose prices are being controlled and whose output increase is clearly desirable. The sequencing of input and output policies must be appropriate.

OUTLOOK

The liberalisation of the fertiliser industry in Kenya was supposed to promote increased fertiliser use by depressed prices through competition. While this has not been realised so far the goal may be achieved in the near future because of a number of reasons:

i) In November, 1992 the government introduced the auctioning of coffee and tea in foreign exchange. Exporters of coffee, tea and horticultural produce are currently allowed a 50% retention of their foreign exchange proceeds. If the government liberalises the marketing of these commodities further so that farmers benefit wholly from their foreign exchange earnings the farmers will respond by application of more fertilisers to these crops thus enhancing production. Recent trends towards timely payments for these crops will encourage fertiliser use.

ii) The liberalisation of the maize market has seen a sharp increase in the producer prices of maize. This should encourage farmers to increase fertiliser use.

iii) The country is also likely to benefit from cheaper fertiliser produced in the PTA region. This is a goal worth pursuing as the country has no comparative advantage in fertiliser production currently.

iv) The government is committed to liberalise the fertiliser market. If this is backed up by development of the infrastructure and quality control of the fertiliser, together with efficient extension service more farmers will use the input

CONCLUSIONS

Kenya's arable land is limited. Therefore, given the high population growth rate of 3% per annum and being an agro-based economy, further growth will be dependent on the intensification of production on the limited land. This will be achieved through switching to production of high-valued crops and increased use of high-yielding varieties (HYV) of seed which are responsive to fertiliser. As a first step, farmers need to be encouraged to adopt the improved husbandry methods of crop production which do not involve big financial costs such as timely planting, proper spacing and weeding.

The adoption of improved technology which involve use of HYV and fertiliser will be crucial in the intensification process. With regard to fertiliser use, several constraints to the use of the input have been identified and have continued to be addressed by the government. The government appears committed to ensure availability of fertiliser when needed by farmers in appropriate package sizes. The government has intervened in the past with the purpose of protecting farmers from high prices due to exploitation by traders and conserving foreign exchange through issuing of import licensing. However, it is found that some of these measures sometimes produce the opposite effect.

The liberalisation of the fertiliser subsector has offloaded direct fertiliser marketing activities from the government. It is expected that through active private trade activities, the fertiliser distribution network will eventually be expanded to include most farming areas. Competition will likely bid fertiliser prices down in the long run and farmers will be served in a cost effective manner. However, the government must in the process monitor the prices of the products to ensure that the net returns to production justify continued use of fertiliser and therefore continued growth in production to support the growing population and therefore the achievement of food security.

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Appendix 1: Analysis of Selected Fertiliser Products

Product	N	P_2O_5	K_2O
Mono Ammonium Phosphate (MAP)	11	21	0
Double Ammonium Phosphate (DAP)	18	46	0
Triple Super Phosphate (TSP)	0	46	0
Single Super Phosphate (SSP)	0	20	0
Calcium Ammonium Nitrate (CAN)	26	0	0
Ammonium Sulphate Nitrate (ASN)	26	0	0
Urea	46	0	0
20:20:20)	20	20	20
20:10:10)	20	10	10
17:17:17) NPKs	17	17	17
15:15:15)			
6:18:20	16	18	20
25:5:5 + 55	25	5	5+55
Muriate of Potash	0	0	60

NB:

1. The formula for determining the nutrient content of a given amount of fertiliser. For instance DAP is 18:46:0, therefore if you have 1000 Kg of DAP it will contain 1000 x 0.18 = 180 Kg of N, 1000 x 0.46 = 460 Kg of P_2O_5, 1000 x 0 = 0 Kg of K_2O

2 Example of straight fertiliser is TSP, SSP, CAN and Urea.

3.4

WOMEN'S ACCESS TO LAND, SECURITY OF TENURE AND AGRICULTURAL PRODUCTIVITY: A CASE STUDY OF MONZE DISTRICT, ZAMBIA

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ABSTRACT

In view of the emphasis given to improving women's total agricultural production and welfare in Zambia, the main objective of this study was to determine whether women's agricultural productivity is affected by the amount of land they have access to and the type of land tenure security they exercise over their land parcels. Other factors expected to affect women's productivity were also examined. These included gender of head of household, women's marital status, level of decision making power, input and labour use as well as access to extension services and level of education.

While total production was found to be positively related to the area of land women had access to, women with access to more land were found to have lower productivity then those with access to less land. The type of land tenure security was found to have no effect on women's productivity. The level of decision making power was found to positively affect women's productivity as were labour and input use intensity.

INTRODUCTION

Statistical records show that 56 percent of the subsistence farmers in Zambia are women (Zambia, 1991). This means that increased agricultural production which has been a major policy goal since the collapse of copper prices in the 1970s can only be achieved if the majority of the women are provided with an opportunity to have access to productive resources.

Research findings have shown that women lack access to productive resources and that many of the policies pursued by African countries have in many ways marginalised women and thereby jeopardised food production (United Nations, 1989). The situation is said to be worse for women in female-headed households. Due et al (1987) showed that female-headed households are poorer and have less productive resources than joint households. Phiri (1986), in a study of 100 male-headed households and 100 female-headed households in Malawi found that the latter had only 58 percent of the cash income of male-headed households and lacked finance, land, skills and inputs for production.

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Given the developing countries' relative endowment in labour and land, it is natural to expect that they would emphasise optimal exploitation of these two resources in their quest for increasing food security. Contradicting suggestions have been cited on the influence of land tenure security on agricultural productivity. Feder et al (1988) in their study in Thailand found that high land tenure security was positively related to input use and hence productivity. Studies in sub-Saharan Africa (Migot-Adholla, 1991 and Oluoch- Kosura, 1990), however, could not confirm any relationship between land tenure security and productivity. In the light of these results, it is still questionable whether African governments should strive to increase women's control over their land parcels in a bid to increase their productivity. The objective of this paper is to investigate how access to land and security of tenure influence agricultural productivity among women in Zambia.

METHODOLOGY

In February and March 1993 a sample of 100 women was interviewed to ascertain the amount of agricultural land accessible to them, the type of land tenure security they exercise over it and their agricultural production. The sample was selected from three agricultural blocks of Monze District which is situated about 200 kilometres from Lusaka in the plateau zone of the Southern Province of Zambia. Stratified sampling was used to come up with the final list of women to be interviewed.

Primary data were collected for the following specific variables:

I) area of land owned and/or operated by women

ii) type of land tenure security exercised by women on their land parcels

iii) production of food and cash crops by area and total yield for the season 1990/91

iv) other factors: input use, labour use, credit availability, extension services, level of education and decision making power.

Three types of land tenure security were identified as classified by Migot-Adholla, *et al* (1990). These were *limited transfer rights* which refers to parcels of land which may not permanently be transferred by the current operator or on which she cannot grow perennial crops or annual crops on a continuous basis; *preferential transfer rights* for parcels of land upon which the current operator has a right to cultivate perennial crops or grow annual crops on a continuous basis and make permanent improvements but cannot sell the parcel of land (she can, however, bequeath or give it to members of the same family); and *complete rights*, which applies to parcels of land whose current operators have all the user rights, including the right to sell or claim the benefits from land improvements.

Due to the crude nature of the primary data collected, more statistically nuanced techniques were not ventured into. A simple tabulation is used to investigate how access to land and security of tenure affect total agricultural output and productivity, respectively.

Ordinary Least Squares (OLS) technique was applied in the analysis of the factors which influence variability in productivity among women. The OLS model was of the form:

$$\mathbf{Y = a + \beta_1 X_1 + \beta_2 X_2 + B_3 D + e}$$

where

Y = Value of output per hectare (Kwacha)
X_1 = Input use per hectare (Kwacha)
X_2 = Labour use per hectare (Man-days)
D = Vector of dummy variables for gender of head of household, level of education, access to extension services, tenure security and decision making power.
a, β_1, β_2 and β_3 = equation parameters
e = error term assumed well behaved as per OLS requirements.

Variables under D are explained as follows:

D_1 = 1 if male-headed or 0 if female- headed
D_2 = 1 if Primary Education or 0 if otherwise
D_3 = 1 Secondary Education or 0 if otherwise
D_4 = 1 if the woman had access to extension services or 0 if otherwise. A woman was considered to have access to extension services if she had had visits from the extension officers or had attended a course at a Farmers Training Centre or was a member of an agricultural project group.
D_5 = 1 if preferential rights or 0 if otherwise.
D_6 = 1 if complete rights or 0 if otherwise.
D_7 = 1 if high decision making power or 0 if otherwise.

A woman was considered as having high decision making power if she had a say in two or more of the following, including control over income: production decisions and use of inputs, marketing of produce, consumption of produce and control over income and expenditure.

RESULTS

Total Production Characteristics

After analysis it was found that 54 percent of the sample were married women, 20 percent widows, 19 percent divorced and 7 percent single. Thirty five percent were from female headed households while 65 percent were from male headed households. Only twenty six percent had access to credit facilities while 75 percent had access to extension services.

Results in Table 1 show that on average women with access to more land had higher total production. Total production was the value of all the agricultural produce for the particular season. Women in female headed-households, with an average area of land of 4.05ha had higher total production than women in male-headed households who had access to an average of 2.17ha. Widows had the highest total production than other women while

women with complete rights had the highest production than those in other categories of lower tenure security.

The above findings were however, not supported by productivity figures. Bye and large, access to bigger land parcels did not appear to influence productivity positively. For example, women in female-headed households, with access to 4.05ha on average, had productivity of only K4,728/ha whereas women in male-headed households with access to 2.17ha had productivity of K6,298/ha. According to marital status, widows with access to 4.85ha on average, had productivity of K4,891/ha compared to K6,331/ha for married women with access to an average of 2.15ha. The explanation to this low productivity for women with access to higher amounts of land are the amounts of inputs and labour used per hectare. Both input use and labour use per hectare were lower for women in female-headed households than for those in male-headed households thus accounting for the lower productivity. In terms of marital status, married women were shown to use the highest amounts of inputs and labour per hectare thus explaining their having the highest productivity compared to women of other marital status.

According to Table 1 productivity did not show a defined relation with the type of land tenure security a woman had. Both, women with limited rights and those with complete rights showed higher productivity than those with preferential rights indicating that they both used more inputs and labour per hectare.

Table 1. Input Use, Productivity and Access to Land by Women

Criteria	Mean Area (Ha)	Mean Production (Kwacha)	Land Productivity (Kwacha/ha)	Input Use/ha (Kwacha)	Labour Use/ha (Mandays)
I. Gender of Head					
a. Female	4.05	18,913	4,728	1,240	45
b. Male	2.17	13,857	6,298	1,664	62
II. Marital Status					
a. Married	2.15	13,613	6,331	1,629	65
b. Single	2.88	15,560	5,402	929	41
c. Divorced	2.82	12,631	4,479	1,239	40
d. Widow	4.85	23,722	4,891	1,130	48
III Tenure Security					
a. Limited	1.8	11,520	6,400	1,245	68
b. Prefere-ntial	4.5	21,384	4,720	1,040	41
c. Complete	5.75	33,650	5,852	1,898	68
IV. Access to Credit					
a. Yes	3.05	18,839	6,176	1,651	-
b. No	2.81	14,486	5,155	944	-

Source: Mwambazi (1994)

The results suggest that having access to higher amounts of land alone is not enough to increase women's productivity. However, increased access to land accompanied by increased input use per hectare will increase productivity as shown by the criterion of access to credit.

Regression Results

Results in the regression analysis presented in Table 2 show that while gender of head of household, decision making power, input use and labour use per hectare are important factors affecting women's agricultural productivity, the type of land tenure security did not seem to be an important factor.

Table 2. Regression Results of the Productivity Model

	Dependent variable: Total Production/Area ('000 Kwacha).		
Independent variable	B	SE B	T-RATIO
Intercept	-5.122	2.516	-2.035
Input use/ha (X_1)	1.623E-03	3.016E-04	5.383**
Labour use/ha (X_2)	0.049	0.004	10.365**
Gender (D_1)	1.721	0.763	2.255*
Education 1 (D_2)	-0.218	0.923	-0.237
Education 2 (D_3)	0.063	1.071	0.060
Extension (D_4)	0.633	0.668	0.948
Tenure security 1(D_5)	1.053	0.694	1.517
Tenure security 2(D_6)	1.717	2.037	0.843
Decision making (D_7)	1.331	0.679	1.958*

$R^2 = 0.715$ $R^{-2} = 0.686$ $F = 24.59^{**}$ $DW = 1.928$

** Significant at 0.01

* Significant at 0.05

Source: Mwambazi (1994)

Both input use and labour use per hectare show that the more intensified the production the higher the yields and hence higher output per hectare. The results are similar to those of Due et al (1990) and emphasise the importance of increasing availability of purchased inputs to women farmers. Any factor which can improve the use of inputs and labour is also expected to improve productivity.

The significant effect of gender of head of household can be explained by the fact that women in male headed households were found to use more inputs and labour per hectare than those in female-headed households (Table 1). The result supports the finding by SATEP (1985) that female headed households were worse off in terms of productivity and agrees with Chileya (1990) that women in female headed households, especially widows, were the most disadvantaged in terms of access to productive resources, in this case purchased inputs

and labour. Since most women in male headed households are married women these results explain why married women showed the highest productivity in Table 1.

Decision making power could also be associated with the amounts of input use and labour use per hectare. Women with higher decision making power, especially in the control of income arising from produce sales, have more incentive to provide more labour and use more inputs and hence the higher productivity.

Although Table 1 showed that women with high land tenure security have higher total production, this seems to be due to the fact that they also had access to more land rather than that they have higher productivity. The regression results could not confirm that land tenure security is an important factor affecting women's agricultural productivity. This result supports the findings of studies done in sub-Saharan Africa about the effect of land tenure security on farm productivity (Oluoch-Kosura, 1990 and Migot-Adholla, 1991). Generally, these studies point that land tenure security is not correlated with any of the factors of production except the amount of land accessible to women which on its own has no positive effect on women's productivity.

Both limited transfer rights and preferential transfer rights involve women with no title deeds and hence none of them is better off in terms of access to credit and purchased inputs. Women with complete rights did not also obtain credit using land as collateral mainly because of fear and complicated procedures. Overall, the results showed that having more control over land parcels does not seem to increase women's accessibility to other productive resources like purchased inputs and labour and hence has no effect on their productivity.

CONCLUSIONS AND RECOMMENDATIONS

Low productivity among women farmers in Zambia is not caused by either their limited access to land or lower tenure security. Women's access to more purchased inputs and labour availability have more significant influence on their productivity than the amount of land they have access to or the amount of control they exercise over land. The factors affecting input and labour use, such as access to credit and decision making power, are also important in improving women's productivity.

It is therefore recommended that the Zambian government should encourage farm technologies which minimise drudgery among women thus making more labour available to operate the land. Policies emphasising price incentives and access to purchased inputs could lead to higher agricultural productivity than those directed to sensitive issues of land tenure, particularly security of tenure. Availability of land is as yet not a major constraint to expansion of production. However, sustainability in output growth will require that women, who constitute the majority of Zambia's smallholder farmers, get access to purchased inputs in order to increase the productivity of their labour and land.

Extension services constitute an important link between research and farm levels and cannot therefore be neglected, our regression results not withstanding. Increased extension

coverage would also strengthen the links between women farmers and sources of credit and purchased inputs, two of the factors with significant bearing on women's productivity.

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3.5

URBAN MAIZE MEAL CONSUMPTION PATTERNS: STRATEGIES FOR IMPROVING FOOD ACCESS FOR VULNERABLE URBAN HOUSEHOLDS IN KENYA

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INTRODUCTION

The case for structural adjustment and food market reform, while widely accepted by donors and international analysts, has not been fully convincing to many African policy makers. Even though numerous African governments have embarked on such reform programs, internal dissent can and often has overturned them and reimposed controls on food prices and trade.

Throughout the reform processes, concerns have arisen regarding the social costs of food market reform, particularly the impact on low-income consumers. Subsidies on some staples have been so high that their elimination has entailed substantial price increases for consumers. A critical problem facing African governments has been how to keep food prices at tolerable levels for poor consumers at a time when production incentives must be increased and subsidies must be eliminated. The purpose of this paper is to determine how food consumption patterns might change in response to various relative price and convenience scenarios conceivable under market liberalisation in Kenya, and to assess the implications of these findings for urban food security policy.

In much of Eastern and Southern Africa, there has been a long-standing perception that urban consumers strongly prefer the relatively expensive refined maize flour produced by large-scale industrial mills over less refined hammer-milled flour and are not responsive to relative price changes between them (Stewart, 1977; Bagachwa, 1992; Jayne and Rubey, 1993; Guyton and Temba, 1993). This view can be contrasted with the alternative hypothesis that maize meal consumption patterns are largely a manifestation of government policy over the decades.

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[a] Egerton University, Policy Analysis Matrix Project.

[b] Michigan State University, USA.

[a]/ For examples in Tanzania, Zambia and Kenya, see Amani and Kapunda (1990); Jones (1994) and Gordon and Spooner (1992).

While consumption of the more costly sifted flour is partially determined by attributes of the product itself, its perceived popularity may have been exaggerated by decades of controls on maize marketing, which have restricted consumers' access to the less expensive, unrefined maize meal (posho) through informal trading and milling networks, and by large subsidies on sifted meal. The perception of strong preferences for sifted meal has been reinforced by substantial advertising by large-scale milling firms portraying refined maize meal as a sign of sophistication and modernity. An implication of the conventional wisdom is that market reforms that eliminated subsidies on refined maize meal would exacerbate food insecurity of low-income consumers without inducing a shift to cheaper maize products.

Ironically, while much research has been devoted to understand how producers and traders would respond to reform in the market for Kenya's main food staple, relatively little is known about the potential response by consumers. The empirical evidence presented in this paper is based on surveys of 344 households' maize consumption patterns in Nairobi during October 1993.[2] We highlight five conclusions with broader implications for food policy in Eastern and Southern Africa:

1. Consumer preferences can be largely policy-driven. Maize meal consumption patterns in Nairobi appear to largely reflect the influence of food policies that have affected the relative convenience and affordability of sifted flour in relation to posho flour. These results are in contrast to the conventional wisdom throughout much of Eastern and Southern Africa that urban consumers have an inherent and rigid preference for refined maize meal. More accurate *ex ante* knowledge of how consumption patterns might respond to policies that alter the attributes of particular products (such as convenience and relative prices) may raise policy makers' receptiveness to a liberalised marketing system. A corollary of this is that policy makers' may feel less compelled to reimpose controls at a later stage.

2. Consumer subsidies on refined maize meal in Kenya have not necessarily promoted food security, because they (and associated controls on maize marketing) have entrenched a relatively high-cost marketing system and impeded the development of lower-cost channels from developing. Regulations or inefficiencies at certain stages of the controlled marketing system may impose redundant costs that overwhelm the effects of direct government subsidies. Findings indicate that the subsidy on sifted flour during 1993 was approximately equal to the difference in milling margins between the large-scale roller milling firms and informal hammer mills.

3. Posho meal consumption in Nairobi appears to be negatively related to household income, while sifted meal is positively related to income. These findings indicate that

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[2] The October 1993 surveys were conducted when subsidies on sifted (refined) maize meal were in place. These subsidies and other market regulations favoring large-scale milling firms were subsequently eliminated in December 1993. The findings of this study therefore provide *ex ante* estimates of the behavioral responses of Nairobi consumers to the recently adopted marketing and pricing changes, and their implications for urban food security.

the subsidy on sifted flour was captured primarily by high income consumers. These findings also suggest that posho meal is to some extent self-targeting, i.e., it would be the product of choice for many low-income households. These findings are consistent with recent findings elsewhere in Southern Africa (Rubey, 1993; Jayne, et al., 1994).

4. The time required to process or acquire posho meal appears to be an important factor influencing its consumption, highlighting the importance of convenience and competing demands on household members' time. Logit model results also indicate that a given Nairobi household's probability of consuming posho meal is positively related to proximity of the family's home to local hammer mills, and negatively associated with households where the woman of the household works in a full time job. The survey evidence suggests that posho consumption may be more strongly influenced by policies affecting the time costs of acquisition than policies affecting relative prices of sifted and posho meal.

5. Market reforms that allow consumer preferences to be better articulated through the food distribution system may facilitate (a) improvements in access to food and the nutritional content of food consumed without need for subsidies, (b) productivity gains in the agricultural system through shifts in choice of technique, and (c) growth in employment and income distribution from shifts in volumes through alternative marketing channels and their associated technologies.

BACKGROUND

Several types of maize meal products are produced for human consumption in Kenya, but two are the most common: a highly refined sifted maize meal processed by large-scale urban roller milling firms (80% extraction rate), and an unrefined whole maize meal, locally known as posho, processed by small-scale hammer mills (96-99% extraction rate). Unit production costs for whole meal, excluding maize grain, are less than 28 per cent those for the highly refined sifted maize meal (Mulinge, 1992). In addition, whole meal is more nutritious than sifted meal.[3]

Sifted flour is actually a relatively new product. The roller mills that produce sifted flour were only established in Nairobi on any scale in 1955 (Stewart, 1977). At that time, maize meal was produced almost exclusively by small hammer mills and hand pounding. However, within 25 years, urban maize meal consumption in Kenya was predominantly in the form of sifted flour. This substantial shift is, no doubt, explained by a combination of factors such as inherent taste and cooking attributes of sifted flour compared to whole flour, government policies affecting relative price and accessibility, and advertising. The relative importance of these factors has received little research attention, yet would have important implications for the development of strategies to promote vulnerable urban households' access to food. For example, if urban consumers have a strong taste preference for sifted flour, and are not

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[3] For example, whole meal has 18% more protein, 183% more calcium, 282% more iron, 114% more thiamin, 16% more riboflavin, and 80% more niacin, by weight, than sifted flour (West et al. 1987).

responsive to price differences between various types of maize meals, then attempts to promote small-scale mills in urban areas would be unsuccessful in protecting consumers against sharp increases in the price of sifted flour. On the other hand, if low-income consumers would readily purchase whole meal if it were more accessible to them at some price discount relative to sifted flour, then market reform programs that entailed the elimination of subsidies on sifted flour distributed through the official marketing system may not adversely affect (and may even improve) household food security. The following sections examine these issues empirically.

METHOD AND DATA

Analysis is based on data from a stratified random sample of 350 households in Nairobi in October 1993. The sample was derived from the Central Bureau of Statistics' Income and Expenditure sampling framework, which is designed to achieve representativeness with respect to population and average household income for each of Nairobi's 30 estate areas. Respondents were asked detailed questions about their maize procurement and consumption behaviour over a normal week and month, more general information about consumption, production, income and expenditure over the past marketing year (October 1992-September 1993), and whether there were any seasonal variations in the variables under analysis. Of the 350 households, 344 valid cases were obtained for tabular analysis, and 290 valid cases were obtained for Logit analysis.

To quantify the *ceteris paribus* importance of factors likely to affect a Nairobi household's decision to consume posho meal, Logit regression models were estimated using the survey data. Logit models are used to estimate a binary (yes or no) variable, and, in this case, indicate how the probability of consuming whole meal by a household is affected by particular attributes of that household. Maximum likelihood estimation was employed to carry out likelihood ratio tests on whether these attributes are statistically irrelevant in the determination of the probability of a given household consuming whole meal (see Kmenta, 1986).

RESULTS

Virtually all the households in the sample purchased maize meal. More than 41 per cent received some maize grain from their rural homes and spent one to two hours on average to get the grain milled at a small-scale hammer mill. Less than 5 percent planted maize on urban plots. The average quantity of maize meal consumed per adult equivalent (AE) was 1.68 kilograms per week (7.22 kgs per month). As per capita income increased, the total quantity of maize meal consumed decreased.

The average household expenditure on maize was Kshs 988.5 per month. This is more than 12 per cent of the average household income. Expenditure on maize as a percentage of total income decreases from 16 per cent for the poorest 20% of the households to 1.3 per cent for the richest 20%.

Maize Meal Preference by Type and Household Income

When maize meal consumption patterns by type of meal and income are analysed, two points stand out clearly. First, at all income quintiles there are already some households consuming whole maize meal. This is contrary to the common view that posho meal is avoided by urban consumers (Stewart 1977). More than 30 per cent of the households in the sample indicated that they consumed whole meal. Over 50% of the maize meal consumed by households earning less than Ksh.4,000 per month was in the form of hammer milled posho meal. By contrast, only 23% of the maize meal consumed by households earning more than Ksh.12,000 was in the form of whole meal.

Second, the quantity of whole meal consumed is negatively related to household income whilst the quantity of sifted maize meal consumed increased with income. This indicates that whole maize meal has inferior good attributes, *i.e.,* it may actually be the meal of choice for low-income households. The findings also indicate that blanket government subsidies that encouraged the production and consumption of the more expensive highly refined maize meal were not only untargeted but actually regressive in terms of income distribution. Of the sifted maize meal consumers (66% of the total sample), only 7.8% were from the poorest 20% of the population.

Policy Regulations and Maize Consumption Patterns

The survey results suggest that sectoral policies have had an important role in the formation of present urban maize consumption patterns in Nairobi. Price and convenience, both of which are affected by policy, emerged as the two most important factors determining consumer choice for a given type of maize meal (Table 1). More than 64% of those households purchasing sifted maize meal chose it because it was convenient to procure compared to posho meal. By contrast, only 18% of the households purchasing sifted flour did so primarily out of a taste preference.

About 60% of those who consumed whole meal chose it because it was cheaper. It should be noted that during the survey recall period (October 1992 to September 1993), prices at which most hammer millers and consumers purchased maize grain through the informal market were generally higher than the subsidised price at which sifted flour manufacturers purchased grain from the government marketing board. Hence, it is probable that the proportion of households consuming posho meal would have been somewhat higher if the maize procurement price for large-scale and small-scale millers would have been equal.[4]

Movement controls, milling quotas and other policy regulations that restricted households' and informal millers' access to grain have had the effect of inflating the time costs of procuring maize grain for cheap whole meal production. In over 85% of the

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[4] Lewa (1994) estimates that, after the removal of the subsidy on sifted flour in December 1993 and the consequent increase in sifted flour prices relative to posho, the proportion of Nairobi consumers buying posho meal rose to about 75% in January 1994.

households, it is the wife who is expected to procure food supplies for the household. Given that more than 80% of these women have full-time jobs (in addition to homemaking), the opportunity cost of time spent procuring a given food product becomes a crucial determinant of whether or not it is consumed. This is especially the case when the cost advantage of posho meal is eroded by subsidies on sifted flour. Thus by restricting assess to cheaper whole meal, policy has apparently biased present urban maize consumption patterns towards the use of the more expensive and less nutritious sifted maize meal.

Table 1: Primary reasons for consuming alternative forms of maize meal.

Type of Meal	% of respondents consuming:	Primary reason for consuming a given type of meal					
		relatively inexpensive	*convenient to procure and cook*	*more nutritious*	*more hygienic*	*tastes better*	*easy for children to digest*
		---------- % of consumers ----------					
Sifted	66	7.8	64.3	1.3	3.4	18.2	5.2
No.1	2	42.9	28.6	14.3	0	14.3	0
Posho	32	59.0	4.8	33.3	0	2.9	0

Respondents were also asked to specify the most important attributes guiding their choice of maize meal. Of all the households that considered convenience as their main consideration, more than 95% consumed sifted maize meal. About 75% of those desiring a cheaper product consumed whole meal.

Apart from price and convenience, 13% and 12% of the respondents considered taste and nutrition, respectively, as the most important attribute in choosing a maize meal product. For those respondents most concerned with taste, 90% chose sifted flour. This supports the widespread perception that sifted flour is more preferred than whole meal on the basis of taste (other attributes held constant), but refutes it in that only a small percentage of households make their consumption choice on this criterion. More than 89% of those particularly interested in a nutritious maize meal consumed whole meal. This indicates that many urban households are already aware of whole meal's superior nutritional quality. Survey results also refute the notion that many consumers avoid hammer milled meal because it is not hygienically produced. Of those households consuming sifted flour or Number 1, only 3% stated that cleanliness was a major consideration. This factor may nevertheless be a contributing reason for avoiding hammer milled meal, and may require further attention in the formulation of strategies to enhance low-income consumers' access to food through the development of small-scale milling.

Potential Changes in Urban Maize Meal Consumer Preferences Under Market Reform

Maize market reform is expected to reduce marketing costs of maize traded through unregulated channels (Argwings-Kodhek *et al.* 1993; Odhiambo and Wilcock 1990). At the same time, the removal of subsidies forces large-scale maize millers who have in the past benefited from subsidised NCPB maize grain to pay more for their supplies through the official channel. Indeed, immediately after the removal of controls and subsidies on December 28, 1993, the price of sifted maize meal rose by more than 53%. Yet urban consumers can still obtain whole posho meal at prices generally below the previously subsidised price of sifted maize meal. This is because the reforms increased urban households' access to maize grain, which then enabled them to take advantage of a lower-cost hammer milling technology relative to the higher-cost (albeit subsidised) roller milling technology.

The demand for convenience may have a similar, if not greater impact on maize consumption patterns than the reduction in the price of whole meal relative to sifted meal (Table 2). Holding convenience constant and varying the price discount of whole meal from 12 per cent to 22 per cent, the proportion of households choosing to buy whole meal hardly changes. However, this proportion increases from 38% to 58% if we hold price constant and vary the time required to procure whole meal from two hours to zero. Half of those households in the lowest income quintile who were consuming sifted maize meal indicated they would switch to consuming whole meal if it were readily available at their regular shop at a 12% discount.[4] These results highlight the critical importance of lower time costs of maize meal procurement in strategies designed to promote household food security through shifts to lower cost maize products.

Table 2: Percentage of households preferring whole meal under alternative price and convenience scenarios

Price discount of whole meal relative to sifted flour	Time needed to procure grain and mill it into whole meal		
	0 hours	1 hour	2 hours
% discount	% of respondents stating a preference for whole meal		
0	42	na	na
12	58	40	38
22	59	40	39

na: data not available for this scenario.

[4] Twelve percent is a conservative figure compared to the actual price discounts observed since the reforms of December 1993.

However, the dominance of convenience may not hold for all income groups. There is abundant empirical evidence that low-income consumers are quite price. In a reformed market where the price differential between sifted and posho meal is likely to increase, a greater proportion of low-income consumers might change to whole meal. This is supported by the Nairobi survey, which indicates a substantial change in purchasing behaviour among the lower-income households when posho is more readily available and at a price discount. For example, 74% of the households earning between Ksh. 6,000 and 8,000 stated that they would buy whole meal if readily available at a 22% price discount.

Logit Model Results

A Logit model was specified to quantify the *ceteris paribus* importance of factors likely to affect a Nairobi household's decision to consume posho meal. The general specification of the Logit model is:

$$\log p(y=1)/p(y=0) = C + S\, B_i X_i$$

where $p(y=1)$ is the probability that variable y equals one, and $p(y=0)$ is the probability that y equals zero, C is a constant, X_i are the i explanatory variables and B_i are the associated i coefficients. Note that $p(y=1)/p(y=0)$ is the ratio of the odds of y=1 against y=0.

We specify y to take on a value of 1 if the household consumed posho meal and 0 for sifted flour. This variable was regressed on a constant *(C)* and the following variables that are considered predetermined and representative of purchasing power, procurement convenience, and other structural factors affecting choice of meal (expected sign of coefficient in parentheses): household income *(INC)(-)*; adult equivalents in consumption *(AE)(+)*; a dummy variable, *REGION*, with value 1 if household originates from the western maize surplus areas of Kenya and 0 otherwise (+); the number of grinding mills within 5 kms of the household premises *(MILLS)(+)*; and *JOB*, a dummy variable with value 1 if the woman of the household works in a full-time job and 0 otherwise (-).

Results are presented in Table 3. The model correctly predicted 76.6% of the 188 households consuming sifted flour and 62.7% of the 102 households consuming posho flour. The value of the likelihood ratio index was .175, where the constrained estimation was B_i=0 for all B. Likelihood ratio tests rejected the null hypothesis that X is irrelevant in the determination of $p(y=1)$ at the .05 level for all variables except *JOB* and *MILLS*. All of the coefficients had the expected signs. The significantly negative coefficient on household income supports the earlier contention that whole meal is an inferior good (i.e., its consumption tends to fall as incomes rise). Results indicate that a Ksh. 1,000 increase in monthly household income is associated with a 6% reduction in the probability that a given household will consume posho meal. Large family size was also significantly associated with the likelihood of consuming posho. An additional adult-equivalent in the household increased this probability by 6.3%. Households originating from western surplus areas (primarily Luo, Luhya and Kisii ethnic groups) were also more likely to consume posho meal than their Eastern neighbours.

JOB and *MILLS* are included to capture women's' opportunity cost of time for procuring posho meal and the convenience of hammer mills' location to the home. While the coefficients of both variables were of the expected sign, neither were significant at the .05 level, and only *JOB* was significant at the .10 level. If the woman worked in a full-time job, the estimated probability that her household would consume posho meal decreased by 12%. These results provide weak support to the survey data in Table 2 suggesting that convenience is a critical dimension of the demand for posho flour.

Table 3. Logit regression results

	explanatory variable						accuracy in predicting	
	C	*INC*	*AE*	*REGION*	*MILLS*	*JOB*	y=0	y=1
coefficient	-2.08	-0.24	0.25	1.52	0.11	-0.48	140/188	65/102
(t-statistic)	(-4.36)**	(-.43)**	(3.27)**	(5.42)**	(1.38)	(-1.79)*	(74.5%)	(63.7%)

Dependent variable is household consumption of posho meal during 1992/93 season (consumed posho=1; did not consume posho=0)
INC = household income.
AE = adult equivalent in consumption.
C = constant term.
** significant at the .05 level
* significant at the .10 level

Maize Meal Consumption Patterns in Historical Context

The survey findings suggest that existing maize meal consumption patterns are largely, but not exclusively, a function of differences in price and procurement convenience between the various types of meal. These factors are in turn a function of the policy environment. This section presents a reconstruction of the possible evolution of maize consumption patterns in urban Kenya (as well as much of Southern Africa). The model presented is in contrast to the conventional perception that taste preferences for sifted flour have been primarily responsible for the fundamental shift in urban maize meal consumption from posho to sifted flour in the course of three decades.

As mentioned earlier, commercial maize roller milling firms began operating in Nairobi in 1955. At this time, maize distribution into urban areas was tightly controlled by the colonial government. A monopoly Maize Board and associated controls on informal maize trade had existed for two decades. The primary motivations for the controls were to stabilise producer prices and, relatedly, to protect white settler producers from being undercut by cheaper African production.[5] But the controls on inter-district maize movement also had the effect of restricting grain access to traders, millers, and consumers in deficit districts through

[5] For a detailed account of the evolution of maize controls in Kenya, see Mosley (1975).

informal channels. By restricting supplies, the controls also raised the price of the limited quantities of grain that were sold informally in these deficit areas. The main source of maize supplies in urban areas was therefore the state Maize Board, which sold maize only to registered buyers. Selling grain to a relatively small number of large-scale buyers had distinct advantages to the Government, because this reduced per unit transaction costs (compared to selling small amounts to numerous buyers) and, more importantly, facilitated the implementation and monitoring of price controls on maize meal. Therefore, the rise of a few large industrial maize processors to link downstream distribution activities into the official maize marketing system created a convenient and easily-managed system of supplying the urban population with staple food at prices easily controlled by the state.

However, roller mill technology involves larger unit milling costs than hammer mill technology (Stewart, 1977; Mulinge, 1992; Bagachwa, 1992; Rubey, 1994). While movement controls on grain were in force during the period of initial investments in roller mill technology, there were no formal controls on the movement of maize meal. The large roller mills were therefore potentially vulnerable to cheaper posho meal transported into food deficit areas from maize surplus districts. Whether it was for this or other reasons, controls on inter-district movement of maize meal were imposed sometime between 1953 and 1966.[6] With these controls to augment the existing ones on maize grain, the subsequent pattern of maize milling investment was substantially determined.

However, in addition to a policy environment favouring large-scale roller milling firms, we do not wish to underemphasize the taste and cooking attributes of sifted flour that at least some percentage of the urban population found preferable over posho meal. The removal of the germ and pericarp makes refined meal look whiter, last longer, and taste sweeter than whole meal. The preference for refined meal over posho meal -- price being equal -- has also been confirmed by recent household surveys in Zimbabwe, Zambia, and South Africa (Jayne, et al, 1994).[7] However, what consumers preferred to buy under historical price conditions does not necessarily indicate what they would have bought if the market accurately reflected the cost of production difference between the two types of meal. For several decades, the ability of urban consumers to make this choice has, to varying extents in Kenya, Zimbabwe, South Africa, and Zambia, been impeded by policy.

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[6] i.e., between the writing of the Ibbotsen Report (1952), stating that controls on maize end with the ex mill sale of posho) and the Report of the Maize Commission of Inquiry (1966), by which time maize meal trade was controlled.

[7] Some analysts have also contended that households may be averse to posho meal because of its shorter shelf life (posho meal contains oil from the maize germ).

According to the Nairobi respondents that consumed it, posho meal has an average shelf life of 3.7 weeks. For a family of three adult-equivalents in consumption, and a rate of maize meal consumption of 1.68 kgs per adult- equivalent per week as determined by the survey results, a 10 kg bag of posho would be consumed in two weeks. The shelf life problem is probably more relevant to potential commercial manufacturers of whole meal, who would have to be concerned about timely distribution to retail outlets after milling to avoid spoilage.

Therefore, within a span of three decades, urban consumption of maize meal consumption had switched almost entirely from whole posho meal to sifted roller-milled meal. It is not surprising that many policy makers' perceived this shift to reflect an inherent superiority of sifted meal. As demand patterns evolved with (a) the evolution of policy that favoured the development of large-scale roller mill technology, (b) the consequent suppression of decentralised system of informal grain movement and hammer milling, and (c) substantial advertising by large milling firms, the general public began to view urban consumption of sifted flour as a phenomenon of urbanisation, modernity, and technological progress, rather than at least a partial response to policy.

The hypothesis that roller milling firms were able to shape consumer preferences through advertising is supported by statements of large-scale millers themselves. Stewart (1977) quotes the general managers of two major sifted flour manufacturers: "The sifted maize meal was something my Company pioneered in this country, and it has created a market for itself" (p. 213) and "...we have considerable advertising and pains and personal contacts and what-not to pick up a good market" (p. 213).[8] These and related statements support Stewart's observation of "the inherent contradiction between taking consumers' preferences as the ultimate guide to production decisions and welfare, and spending money on determining these tastes" (p. 213).

We therefore suggest that the historical evolution of sifted flour consumption in urban Kenya may be better accounted for by a model that endogenizes consumer preferences, rather than treating them as exogenous. The policy-driven aspects of this model are presented schematically in Figure 2.

The model can be used as a partial explanation for the slow and sporadic pace of maize market reform in Kenya over the past decade. If the conventional view of strong inherent preferences for sifted flour is to be accepted, the ability of informal hammer mills to produce whole meal for the same price as highly-subsidised industrial meal would have appeared largely irrelevant because of the perception that urban consumers would not accept hammer-milled meal. This perception may have narrowed policy makers' view of the feasible set of food market reform options, especially those involving removal of subsidies on industrially-produced sifted flour and the promotion of competitive small scale maize trading and milling networks in urban areas.

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[8] Stewart cites evidence from one inquiry indicating that advertising expenses account for as much as one-third of roller mill production costs.

Figure 2

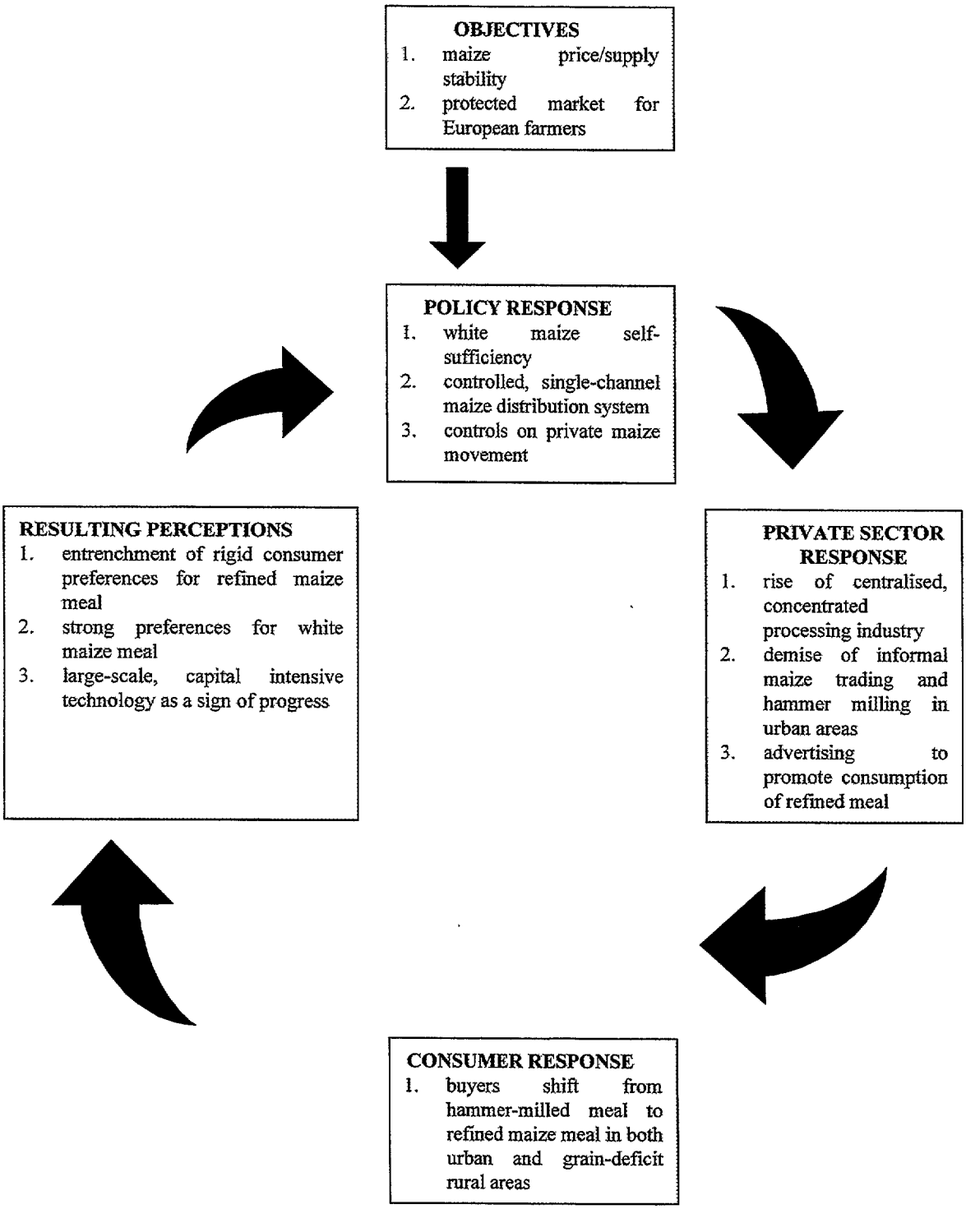

Figure 2. Interactions between Maize Sectoral Policies and Evolution of Maize Meal Consumption Patterns in Urban Kenya, 1955-1980.

POLICY IMPLICATIONS

Four main policy implications emerge from the analysis. Firstly, subsidies on refined maize meal may suppress the development of lower-cost marketing networks which might make available a wider range of goods, some of which might actually be preferred by low-income consumers whom the subsidies were designed to protect. The existence of large subsidies on consumer staples through the official marketing channel does not necessarily mean that the removal of these subsidies would force consumers to pay higher prices for maize meal, if associated market reforms would improve consumers' access to less expensive close substitutes through alternative distribution channels. By broadening urban maize meal consumer choice, maize market reform may be a more cost-effective way of targeting the food security of low-income urban consumers. If whole meal is an inferior good, as our survey results indicate, any public intervention in the market targeted to posho millers either through subsidies, income support, or food aid would create less leakage than an untargeted subsidy on sifted flour.

Secondly, less than 20% of urban consumers in Nairobi appear to have a strong taste preference for the more expensive sifted meal. Urban maize meal consumption patterns are more strongly determined by procurement convenience and relative prices -- largely a function of prevailing and historical government policy. Policy regulations that increased time costs for procuring whole meal and increased its relative price to sifted maize meal have apparently biased urban maize consumption patterns towards the latter. This has hurt low-income urban consumers who would have preferred to consume cheaper and more nutritious whole meal but were forced to consume the relatively more expensive sifted maize meal.

Third, an increase in the demand for hammer milled posho meal would reduce the volume of imported maize required to meet domestic needs, although it would also reduce the volume of by-product available for stockfeed and oil. This is because the extraction rate of whole meal is 24% higher than the sifted meal (Grade 1). If the 472,000 tons of maize grain typically processed into sifted flour in Kenya were to be milled into whole meal instead, this would save more than 92,600 tons (i.e. 472,000 t * .99 - 472,000 t * .80), which is more than 34% of the national strategic maize reserve requirement. In a net import situation, this would amount to huge savings in foreign exchange earnings.

Fourth, instead of implicitly taking preferences as given and formulating food policies around prevailing consumption patterns, we stress the importance of *ex ante* analysis that informs decision makers regarding how preferences may change with policy. Existing consumption patterns may be policy-driven. When given a wider range of products differentiated by price, consumer choices may be more flexible than supposed by conventional wisdom.[9] Improved knowledge of consumer behaviour can widen policy makers' perceptions of feasible options to protect vulnerable groups and increase receptivity to sustaining the recent policy changes in Kenya's maize system.

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[9] There has already been a rapid increase in the number of registered small-scale mills in Nairobi between 1988 and 1993 under the Cereal Sector Reform Program (Mulinge, 1992).

The promotion of posho milling would have several additional benefits. Mulinge (1992) found that small-scale hammer mills in Kenya were relatively more profitable than large roller mills. Stewart (1977) found Kenyan small-scale mills have a higher labour-to-investment ratio and labour-to-output ratio than large-scale milling. Therefore increased small-scale milling would be expected to enhance employment growth and income distribution because of the its low start-off capital costs.

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SESSION 4: AGRICULTURAL DEVELOPMENT AND TRADE POLICIES

Chairman: S. Ehui

Rapporteur: E. R. Mbiha

4.1

A GENERAL EQUILIBRIUM ANALYSIS OF THE IMPACT OF ECONOMIC ADJUSTMENT POLICIES ON AGRICULTURE: RESULTS FROM SUDAN.

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ABSTRACT

A general equilibrium model is developed to analyse the impact of economic adjustment policies on the performance of Sudanese agriculture and the economy. Short run adjustment dynamics, endogenous money creation mechanism and sticky prices are the added Keynesian features of this multi-sector model. Policy simulations indicated that for positive growth and improved performance of the Sudan economy, fiscal and monetary control and less indirect taxation are required to support exchange rate adjustments and liberalisation.

Failure of the various economic recovery programs implemented by Sudan during the 1980's to remove the bias against agricultural exports has been attributed to the unfavourable macro-economic environment in which the devaluation and liberalisation policies were introduced (Ali, 1984; Brown, 1992). Study of the indirect impacts of macro-economic and non-agricultural policies on the farm sector are a recent research phenomenon in agricultural economics. Important connections between nominal exchange rate movements and agricultural trade and prices were first discussed by Schuh (1974). Several studies have researched the impact of exchange rate and other macro-forces on agriculture (Tweeten; Chambers and Just). Other models, using international trade theory and the real exchange rate framework, have been used to examine the incidence of foreign exchange, and commercial and macro-policies on the structure of incentives to agricultural producers and internal terms of trade (Krueger, et al,1988). Limited information, however, is obtained from these models on sectoral adjustment, or disaggregated supply-demand responses.

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A neo-classical approach to studying macro-economic linkages to agriculture has been used in a group of Walrasian computable general equilibrium (CGE) models (Adelman, et al, 1978; Taylor, 1979; Dervis, et al, 1982). While the main focus of these models is on income distribution, growth, and structural change; macro-agricultural linkages are basic components of their detailed disaggregated supply structures. Feed-back from the macro-economy to agriculture, however, is not intensively investigated. These models are generally inadequate in modelling the nominal sectors of the economy, disequilibrium situations, dynamics, and expectations. Some attempts have been made to incorporate Keynesian features and loanable funds markets in the CGE model (Feltenstein, 1984; Taylor and Rosenweig, 1984). Except for the Feltenstein study, which is basically a trade model, money supply has remained exogenous to the system in most models.

This study develops a CGE model of the Sudan economy with specific intent to analyse the impact of structural adjustment policies on performance of the agricultural sector. An endogenous money creation mechanism, an important feature of many developing countries, is modeled to allow for feedback effects from the macro-sectors to agriculture. Economy wide impacts of movements in nominal macro-aggregates are transmitted by the general price level to real price movements. The proposed model accommodates macro-structural features in the foreign exchange and domestic credit markets. Examples of such features are fixed nominal interest and exchange rates. Partial adjustment and expectations schemes are used to model supply in the model. Econometric estimation which provides superior statistical basis for model validation over the commonly used calibration procedure was used to estimate model parameters. Dynamic simulation is used to solve the model for validation and policy analysis.

NEW CLASSICAL CGE AND THE SUDAN MODEL

The standard CGE model builds on the linear multi-sector input-output model by adding more flexible specifications allowing for substitution possibilities in demand and supply spheres of the economy. Production and consumption decisions are modeled on the basis of the neo-classical theory of the firm and consumer behaviour. The stylised CGE model is micro-founded and structural in nature with intersectoral linkages explicitly modeled (for detail see Dervis, de Melo and Robinson, 1982). Special structural characteristics of the Sudan economy, data limitations, and specific features of agricultural supply, led to modifications in the basic CGE model. The model contains fifteen commodity groups, land, labour, capital and money. The main deviations from the standard CGE involve the modelling of domestic product supply and the treatment of money and macro-equilibrium.

Supply of domestic goods and services

Sudan is predominantly an agricultural country. The farm sector is disaggregated into eight agricultural tradables produced in four distinct farming systems, representing different technologies and institutional environments. The eight crops modeled contribute nearly 90% of the export earnings, and provide most of the food supply in the country. There are two main producing regions, the irrigated and the dry land regions, each of which divides into two distinct farming systems. Decision making is highly centralised in the public irrigation schemes where allocations of land areas are made by the scheme administration. Production decisions are decentralised in the other three regions. Farmers in these regions sell their products in competitive markets, except for cotton and gum Arabic in the traditional rain-fed subsector, where marketing boards monopolise their exports. Agricultural producers in the mechanised dry land sector and in both irrigated sectors use intensive mechanisation and have better access to formal credit than those in the traditional sector.

Area allocations to wheat and cotton, which occupy more than 50% of the land, are set by the government agency in the public irrigation schemes, so farmers' decisions are assumed to influence yield rather than production. Agricultural supply is modeled by using yield and area response instead of output supply functions in this and other regions. The procedure accounts for the fact that farmers respond to separate influences in making their area allocation and input intensity (yield) decisions. Lack of sufficient time series on levels of input use, particularly labour and capital by crop and region, precluded the use of primal methods in modelling farm supply. Reduced form response functions are alternatively specified for crop yields and areas in each of the four agricultural regions (Table 1). The specified yield and area response functions reflect partial adjustment in domestic production of agricultural tradables. Agricultural tradables markets are assumed to adjust in a sequence of temporary equilibria along which agricultural producers adjust their expectations and production plans to desired levels.

Reduced form output supply functions are again used to model supply in the non-agricultural tradables (NAT) and homegoods (HG) sectors due to lack of data on input levels. Non-agricultural tradables represents the manufacturing industry in Sudan. It comprises mainly the textile, sugar, and oil industries plus food processing. All non-tradables are grouped into the homegoods sector. Services, transport and construction are the major economic activities in the homegoods sector. Manufacturing and homegoods are mainly urban based and compete with each other for private investment and labour.

The homegoods sector is the only domestic supplier of capital goods. Homegoods are also used for final consumption and as intermediate inputs. The other source of capital goods in this model is capital imports which are considered non-competitive to domestic capital. Intermediate imports are also used by agriculture, manufacturing and the non-tradables sectors. Foreign manufactured goods are imported for final consumption and like capital and intermediate imports are considered non competitive to domestically manufactured goods and hence earn a different price. Foreign wheat, on the other hand, is assumed a perfect substitute to domestically produced wheat where the same price rules for both. The small country assumption is maintained for all imports and exports except for long stable cotton where Sudan is assumed to supply a significant share of the world market.

FACTOR DEMAND, INCOME AND CONSUMPTION SPENDING

In addition to labour and capital, land represents a third primary factor in the model. Area response functions defined earlier drive demand for land. No time series data are available on labour use by crop or region to allow estimation of labour demand and supply functions. The nominal wage rate is therefore fixed exogenously to define an infinite supply of labour by region. There is one type of labour in this model, namely unskilled labour. Labour groups, however, are distinguished by region and as rural and urban. No data is available on the demand for capital by sector of destination. Government investment is set exogenously whereas a private investment function is specified. Total investment spending is thus used to allocate capital demand by sector of origin.

Functional distribution of value added among owners of primary factors is not derived due to data limitations, as discussed earlier. All income generated in this model is paid to a single household sector. From this income the government collects tax revenue. Accordingly there are only two sectors of final demand in the model: households and the government sector. Government consumption spending is set exogenously. Private consumption spending, on the other hand, is endogenously determined (Table 1) and allocated among seven final consumption goods: sorghum, wheat, beans and vegetables, meets and other, imported manufactured goods, non-agricultural tradables and homegoods. The Almost Ideal Demand System (AIDS) of Deaton and Muellbauer (1980) is used to allocate private final consumption demand.

MACRO-ECONOMIC CLOSURE AND MONEY

The macro-structure of the Sudan economy is specified such that excess aggregate demand is allowed in the model. Total private investment in excess of private savings and the fiscal deficit represents the domestic resource gap or excess aggregate demand (in local currency) which is balanced with net capital in flows TB (Foreign claims).

With a fixed exchange rate regime, as in Sudan, this specification allows for disequilibrium in the external balance. Accordingly net capital inflow (TB) is not rationed to serve as an alternative equilibrating mechanism. This assumes that foreigners are willing to hold Sudan's foreign debt. TB is thus endogenously determined as the exchange rate is inflexible. The price of money (P) which is used as the general price level, is endogenously determined in the present model as another equilibrating factor that clears the money market where the nominal interest rate is fixed. As there is practically no bonds market in Sudan, internal imbalances are financed by creation of domestic credit. The limited ability of the central bank in monetary control through open market operations, as typical to most developing countries, is thus recognised in making money supply endogenous to the present model.

A reduced form money supply function is therefore specified in equation 15, such that money supply (M_t^S) moves with fiscal deficits ($-GS_t$), the expected real saving rate (R_{st}), income (Y_t) and the lagged stock of money (M_{t-1}^S). Similar specifications have been used by various authors to allow for endogeneity of money supply in studying the important link between fiscal deficits and inflation in developing countries (Aghevli and Khan, 1978; Taylor, 1979). Demand for real money balances is derived from the asset portfolio choice of households.

Money demand (M^D_t) is modeled using a reduced form function with the expected change exchange rate (B_t), expected real interest rate (R_{st}) and expected rate of inflation (p_t) used as regressors reflecting the opportunity cost of holding domestic money (Table 1).

The study used secondary data on the discussed variables for the period 1961-1986 to estimate model parameters. Subsystem estimation is employed to generate parameter values for this study. Adaptive price expectations schemes are used where last year's realisation is used as the expected price. Dynamic simulation is used to test the model performance and conduct several policy analysis experiments. The Jacobian algorithm in GAMS/MINOS is used to solve the present model. The model gave very close forecasts of the actual path of the economy during 1981-1986. The model is solved for only two consecutive years for policy analysis. Solving for two years in each policy experiment allows for the effects of dynamic lags in the models.

POLICY ENVIRONMENT AND SIMULATION RESULTS

The paper has argued that failure of the liberalisation and other adjustment measures to correct the structure of economic incentives and eliminate the bias against agriculture and exports in Sudan in the 1980's was due to the then prevailing unfavourable macro-economic environment. Various scenarios are used to evaluate the impact on agriculture and the economy of measures that might support devaluation and liberalisation. Final consumption adjusts instantaneously to external shocks in this model. The full effect of policy changes, however, occurs one year later due to partial adjustment in supply of agricultural tradables, private investment and money demand. Therefore, results obtained for the second year only, when full adjustment is completed, are reported in Table 2. The following policy packages were examined.

Exchange Rate Regimes (I)

Equations 6 and 7 of the model indicate that Sudan employs a system of multiple exchange rates (e_i) to value its tradables. Multiple rates distort internal terms of trade and induce inefficient allocation of domestic resources. On the other hand, currency overvaluation contributes to growing external deficits by taxing exports and promoting imports. Unification of the effective exchange rate on all tradables along with devaluation of the Sudanese Pound (LS) to align domestic and international prices was adopted in this experiment.

The results show that exchange rate reforms generate positive impacts on supply of most important agricultural products (cotton, wheat and sorghum) leading to enhanced exports and higher self-sufficiency in food. The resulting growth in agricultural supply indicates that the positive effects of these policies on prices of agricultural tradables (AT) more than offset the negative effects of the higher prices of imported inputs. Demand for intermediate imports increases as the production of cotton and wheat expands.

With the unified exchange rate foreign manufactured goods and subsidised wheat became relatively cheaper to consume than sorghum and non-tradables, given the new inflation rate. This leads to increased importation of manufactured consumer and intermediate goods with the

net effect being negative on the trade balance. As expected, an appreciation in the nominal exchange rate (devaluation) leads to higher levels of nominal aggregates. The high inflationary pressures produced by devaluation indicate that the Sudan economy is highly dependent on the external sector. The deteriorating share of agriculture in nominal GDP can be explained by the excessive rise in the price of homegoods and its high share in GDP (56%).

Food Policies (II)

In addition to foreign exchange interventions, a number of commercial and price policies have led to specific distortions in the Sudan economy. Direct tax/subsidy schemes and control of wheat trade in Sudan, provide an example. Bread wheat was highly subsidised in Sudan, being the basic food for the politically powerful urban population. Subsidisation coupled with considerable food aid donations have stimulated nonproportional growth in wheat consumption in Sudan over the last decade. The government controls the importation and distribution of wheat. Consumers, public producers, and private farmers all face different prices. The multi-tier system of wheat prices used in this model consists of a consumer price (CP_{WT}), a procurement price (PP_{WT}), a free market price (P^F_{WT}) and an import price (P_{WT}).

The impact of removing distortions in the wheat sector is investigated here. In addition to the exchange rate regimes in (I), wheat pricing and importation are liberalised in experiment II. The tax/subsidy structure in the wheat sector is lifted, such that all wheat is traded at its import parity cost (P^*_{WT}) as defined by equation 6 of Table 1 ($P_{WT} = CP_{WT} = PP_{WT} = P^F_{WT}$). The quota on wheat imports is removed and Sudan is assumed to face an infinite supply of foreign wheat at P_{WT}.

Foreign exchange adjustments generate better results with this more competitive wheat policy (Column 3). Larger improvements in the supply of cotton and sorghum, exports, and wheat self-sufficiency are realised. Wheat consumption and importation as well as government deficits drop significantly as the consumer subsidy is lifted contributing to lower trade deficits and slower inflation. Domestic wheat supply falls in spite of improved producer prices. While the import parity price of wheat is higher than the procurement price at which producers in the public irrigation schemes deliver their wheat, the new price is lower than the free market price received by private wheat producers under the quota system (controlled wheat imports). The fixed wheat area in the public schemes limits the impact of better prices on wheat supply to small improvements in yield. Wheat production in the private schemes, on the other hand, where lower prices are received, is more responsive to changing economic incentives as farmers are free to adjust areas. The net effect is thus negative on domestic wheat supply. The higher self-sufficiency ratio results from reduced consumption e.g. less imports. The positive price effect on wheat production would have been much larger if area allocations in the public schemes, where most of the domestic wheat is produced, were decentralised.

Balanced Budgets and Monetary Control (III)

Expansionary fiscal and monetary policies are blamed for the excessive inflation that wiped away the positive effects of devaluation and liberalisation in Sudan (Elbadawi,1992; Ali, 1984; Brown, 1992). Two measures of monetary control are considered to evaluate the impact

of conducive macroeconomic conditions on the effectiveness of the exchange rate and wheat policies discussed above (I and II).

1) Indirect reduction of the money supply through reduced government spending.
2) Liberalisation of domestic capital markets and allowing the nominal interest rate to adjust flexibly (endogenously determined).

Experiment III (column 4 of Table 3) evaluates the efficacy of devaluation and liberalisation policies under a balanced budget. The exchange rate and wheat policies are supported with reduced government spending. Government consumption spending is reduced by 25% in this experiment. Since government consumes only HG's and NAT in this model, reduced spending affects total demand for these two commodities. Consumption demand for HG's and NAT dropped by 4.8% and 6% respectively. More supply is left for export as consumption demand drops. The indirect impact of reduced spending works through the budget deficit, money supply, price of money and real price linkages to all sectors of the economy. Government deficits and the supply of money decline substantially resulting in much slower inflation and real value added gains. The positive effects of the devaluation and liberalisation policies of experiment II (column 3) on value added and agricultural supply are moderated in this experiment as both grow at slower rates with reduced spending (column 4)[1]

Experiments involving monetary (as opposed to fiscal) control through the interest rate were not effective and are not reported here as the control solutions were not significantly altered. The impotency of the interest rate was due to institutional rigidity and redundancy of an almost completely rationed domestic credit market. To improve the role of the interest rate in allocating loanable funds, institutional changes are required to liberalise the domestic credit market and allow for market determination of the scarcity value of capital.

On the other hand, monetary control through reduced government spending as proposed here is certainly a difficult choice for Sudan, where the government still employs a significant proportion of the urban population and, where a massive civil war continues to waste substantial public funds and resources. While it contributes to economic efficiency, reduced budget deficits may therefore generate undesirable employment, distributive and social consequences. Political reforms that would bring about a peaceful settlement to the long-time regional conflict in the country, and hence ease the unnecessary budgetary burdens of the civil war are probably a precursor for the success of any policy.

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[1] It is important to note that experiment III combines the effects of experiment II with reduced spending. The net impact of lower spending, therefore, can be estimated by subtracting the percentage changes in column 4 from those of column 3 of table 3.

Tax Policy (IV)

While structural adjustment calls for reducing indirect taxes which distort relative prices, it has been argued by many authors that this strategy works against stabilisation. This is because indirect taxation is a major anti-inflationary means of financing budget deficits in developing countries (Fischer, 1986). The alternative of increasing direct taxation (income taxes), with reduced taxes on trade is investigated in experiment IV. Indirect taxes on trade (td_i) are reduced by 40% and the direct value added tax is increased from 4% to 6%. The tax policy is applied together with the devaluation (I), wheat (II) and stabilisation (III) schemes.

Reducing indirect taxation improves prices to both producers and consumers. The results reported in column 5 of table 3 also imply that most of the tax on sorghum and cotton trade is borne by producers as supply improves when taxes are removed. The tax on domestic and foreign manufactured goods and non-tradables, on the other hand, is absorbed mainly by consumers as their consumption demand increases with lower indirect taxation.

The positive results on the government deficit, money supply and inflation obtained with a controlled budget under experiment III, are reduced as tax revenues fall with lower taxation. The net effect of substituting direct for indirect taxation does not produce substantial inflationary pressures. The total value of exports grows, reducing the trade deficit by 2%. The above scenario assumes the existence of an efficient tax agency and an institutional set up that ensures successful implementation of the policy. This may not be possible given the difficulty of administering direct tax collection in Sudan. The experiment, however, indicates the importance of lowering taxes on trade and increased reliance on direct taxation in reducing relative price distortions.

SUMMARY AND CONCLUSIONS

The impact of macro-economic adjustments on the performance of Sudanese agriculture and the economy is analysed in this study. An endogenous money creation mechanism is modeled to allow for a feed back effect from macro-sectors to agriculture. The economy wide impacts of movements in nominal macro-aggregates are transmitted by the general price level via real price movements.

Policy experiments indicate that the economy is non-responsive to movements in nominal interest rates as the domestic credit market is highly controlled. Removal of institutional rigidities in the domestic capital markets is therefore necessary for effective monetary control and efficient allocation of capital resources in Sudan. Simulation results provide further empirical support to the argument that expansionary fiscal and monetary policies have worked against stabilisation and economic recovery in Sudan. Results show that fiscal improvements in terms of a balanced budget are essential for a larger contribution of agriculture to total value added and for real GDP growth.

The thesis objecting to removal of indirect taxation for budgetary reasons is challenged by the tax policy experiment results. Results suggest that for positive growth and improved performance of the Sudan economy, monetary control (through fiscal restraint) and minimal

indirect taxation are required to support exchange rate adjustments and liberalisation. Removal of the institutional rigidities in the public irrigation schemes are essential for promoting desired agricultural supply responses and for stronger economic performance. However, serious political efforts to end the massive civil war may be the pre-condition for effective economic reforms, balanced growth and stability in Sudan.

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Table 2. Policy Simulation Results (1982)

Domestic Supply	
1. $(A^l_{at}, YLD^l_{at}) = f(ENP^l_{at}, RW^l_t Z^l_{at})$	area (A) and yield (YLD) response
2. $Q^S_{at} = S_l A^l_{at} \times YLD^l_{at}$	supply of agricultural tradables (AT). a indexes AT, l indexes 4 production regions; t is time. ENP, RW and Z denote expected real net prices, the real wage rate and other fixed factors respectively.
3. Q^S_{nt} $(RNP_{nt}, RW^u_t, Z_{nt})$	
4. $N_{ijt} = b_{ij} Q^S_{jt}$	supply of non-agric. tradables (NAT) and home goods (HG) indexed by n.
5. $N^D_{it} = S_j b_{ij} Q^S_{jt}$	Intermediate use of product i by sector j
Prices:	
6. $P_{it} = e_{it}(1\text{-}td_{it}) \times P^*_{it}$	
7. $e_{it} = e_{ot}(1\text{-}tx_{it})$	total intermediate demand for product i
8. $CP_{WTt} = bP_{WTt}(1\text{-}CSW_t) + (1\text{-}b)P^F_{WTt}$	Price of tradables
9. $NP_{it} = P_{it} - S_j b_{ij} P_{jt}$	
10. $RO_{it} = O_{it}/P_t$	effective exchange rate net of the exch. rate tax/subsidy (tx.)
Income and Demand:	
11. $PIN_t(R_{Lt}, B_t, RP_{it})$	consumer price of wheat. CSW is the consumer subsidy on wheat and P^F_{WT} is the free market wheat price.
12. $PCN_t(R_{st}, B_t, H_t)$	net prices
13. C^D_{it} $(RPCN_t, RP_{it})$	real prices
14. $Q^D_{it} = N^D_{it} + C^D_{it} + V^D_{it} + G^D_{it}$	private investment spending. R_{Lt} is the expected real lending rate, B_t is the expected change in exchange rate, and RP refers to real prices of investment goods AT & HG).
Money:	
15. $M^S_t(M^S_{t-1}, Y_t, \text{-}GS_t, RS_t)$	private consumption spending. R_{st} is the real saving rate and H_t is desposable income.
16. $D\,M^D_t(Y_t, RS_t, B_t, p_t)$	private consumption demand as a function of real private consumption and real prices.
Equilibrium conditions:	
17. $e_{ot} \times TB_t = S_i P_{it}(M_{it}\text{-}X_{it}) = S_i P_{it}(Q^D_{it}\text{-}Q^S_{it})$	total domestic demand. N, C, V and G refer to intermediate, consumption, investment and government demands.
18. $(PIN_t\text{-}PS_t)\text{-}GS_t = e_{ot} \times TB_t = e_{ot} \times F_t$	
19. $Q^S_{it} + M_{it} = Q^D_{it} + X_{it}$	money supply. Y_t is value added and GS is government savings.
20. $M^D_t = M^S_t$	change in money demand. p_t refer to expected rate of inflation.
	trade balance. M and X refer to imports and exports respectively.

4.2

THE COMPLEX ISSUES OF MAIZE MARKETING REFORM POLICY UNDER THE STRUCTURAL ADJUSTMENT PROGRAMS IN KENYA

Mark Ollunga Odhiambo[a]

INTRODUCTION

Kenya, like most countries in sub-Saharan Africa (SSA) has since the mid-1990s been experiencing an endemic economic crisis characterised by: rising unemployment; persistent and widespread poverty; food insecurity exacerbated by frequent drought; low growth bordering on stagnation; severe external indebtedness; and a narrow base of export product mix in the face of falling world commodity prices resulting in low export earnings.

The state of heavy indebtedness and the low export earnings have meant that the capacity to import essential capital stock for development and essential services have been greatly compromised (Lawrence, 1986 and Commander, 1988). Under the influence of the international Monetary Fund (IMF), the World Bank (IBRD) and other donor agencies, the Government of Kenya (GOK) adapted the Structural Adjustment Programs (Saps) in the mid-1980s as policy reform measures to address these economic problems.

Typically, the policy reform measures included in the Saps have involved such steps like: increased export orientation to boost foreign exchange earning capacity; liberalisation of internal trade including that of agricultural commodities; liberalisation of import trade; reliance upon free market forces and price mechanisms including active private sector participation in guiding efficient resource allocation in the production and marketing of goods and services; the devaluation of the local currency to encourage export while discouraging non-essential imports; and fiscal restraint and budget rationalisation on the part of the government.

The SAP package as can be seen, is a comprehensive set of economic measures designed to achieve broad macro-economic goals such as efficiency in resource allocation, sustainable economic growth and correction of balance of payment problem. This paper does not attempt to discuss the general Saps in Kenya, but rather it analyses the attempt by GOK at implementing those aspects of the SAP package covering the liberalisation of the internal trade and reliance upon free market forces and price mechanism in the maize marketing system and the related grain market. We start by analysing the maize production system in Kenya and then the formal and informal marketing systems. The on-and-off partial market liberalisation policy is then discussed within the context of the on-going Cereal Sector Reform Program.

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THE MAIZE SUB-SECTOR

Production System

The majority of Kenyans traditionally depend heavily on grain cereals-based diets supplemented with pulses, milk and meat. The most important grain cereals in Kenya today are maize, wheat and rice in that order, followed by the minor traditional grains like sorghum and millet. Maize was introduced in Kenya in the 16th century but only started being important around 1880 (Chiodo-Juve, 1980) and has since then adapted so well to become the single most important cereal in the country (Odhiambo, 1988).

Being the most important staple food in Kenya, maize is grown in almost all parts of the country to the extent that it could be seen growing even in unsuitable agro-ecological zones. However, the maize production system takes place both under the smallholder production and the large scale farming systems. It has been recognised that the structure of maize production affects its supply patterns and marketing channels in the country (Ackello-Ogutu and Odhiambo, 1986). The small scale farmers produce about 80% of the total annual maize production thereby leaving the large farms with an estimated 20% of the total production. The large scale farms are mainly in the highland districts in the Rift Valley Province (e. g. Trans Nzoia, Uasin Gishu and Nakuru Districts) where maize is grown as a cash crop during the long rainy season. However, smallholder maize production takes place in virtually all the districts in the high and medium potential zones of the country. It is estimated that Rift Valley, Western and Nyanza Provinces combined produce in a given year about 60% of the total smallholder maize (Ackello-Ogutu and Odhiambo, 1986). The rest of the smallholder production comes from Central, Eastern and Coast Provinces.

Recent estimates put 1989/90 maize production in Kenya at around 30 million bags. Due to poor weather, the production declined to about 23 million in 1992/93 season (Kenya, 1993). It has also been feared that following Saps whereby the GOK liberalised the input market and devalued the local currency, most farmers have reduced the level of input use especially fertiliser (Personal Communication District Agricultural Officers, Nakuru, Uasin Gishu and Trans Nzoia Districts). This practice among farmers has also contributed to the decline in yield and total production.

The Marketing System Before the Reforms

Maize marketing in Kenya has evolved over the years to a complex system characterised by two sub-systems - "formal" and the "informal" which run in parallel but are also complementary to each other and are interdependent in some ways. The official or "formal" marketing system is a legacy inherited from colonial times and is monopolised by the National Cereals and Produce Board (NCPB) which was instituted by the GOK under an act of Parliament and legally empowered to handle all the official maize purchases and sales in the country including any maize export and import transactions. The role of the NCPB in maize marketing has generated a lot of controversy especially now and at the time the SAP market liberalisation and reform policies were being introduced.

From colonial times, up to the present moment, the Board's role and activities have been defended by policy makers who see it as an institution for ensuring food security and stabilisation of farm incomes and consumer prices. The Board has always been supposed to meet these objectives through ensuring:

(a) the availability of adequate and affordable food supplies throughout the country thereby preventing malnutrition and food shortages;
(b) stabilisation of producer and consumer incomes through control of both producer and consumer prices;
(c) reliable and secure market outlets for farmers and where possible exploitation of smallholders and consumers by private traders is minimised;
(d) maintenance of strategic maize reserves which can cushion the country against poor harvests or crop failures in bad years; and
(e) control of any illegal maize trade across borders to neighbouring deficit countries. (This last point is now debatable bearing in mind that recent studies indicate that there is net inflow of maize into Kenya, at both borders with Uganda and Tanzania (Argwings-Kodhek, 1992).

Before attempts by the GOK to liberalise the maize marketing system in 1988, the formal marketing system through the NCPB traditionally handled the bulk of the maize from the large scale farms who grow maize as a cash crop and normally market about 90% of their output through this channel. Indeed before the short-lived partial maize market liberalisation in 1991 / 92, it was estimated that maize from the large scale farms accounted for about 60-70% of the maize going through the board, thereby implying that only 30-40% of NCPB maize came from the small scale producers (Odhiambo, 1988). On average, it is estimated that just before the full maize market liberalisation in late 1993, the NCPB was handling about 24% of the total maize production in the country and about 45% of the total marketed output (Kenya, 1993; World Bank, 1990). Before the Cereals Sector Reform Programme (CSRP) was instituted in 1987 / 88, all the maize mills except the small rural "posho" mills had to get their maize supply from the NCPB. Even later when the partial liberalisation of the maize market was in force, the NCPB still supplied 70% of maize to the large mills. The NCPB had to monitor and ensure that the mills only received 30% of their supplies from farmers and private traders. The mills were also required to get movement permits to enable them to move their products (flour and by-products) to the various markets in the country. The Board could also sell by a rationing process, limited quantities of maize to consumers or small scale traders from its depots around the country. The main consumers of the maize and flour in the formal (NCPB) market were and still are the urban consumers who get their flour from the large mills. The majority of the rural consumers normally depend on the maize going through the informal marketing system and only turn to the NCPB supply source in bad years or when local maize shortages occur.

The informal maize marketing system as noted already, has always operated in parallel to the controlled NCPB official channel. It is the predominant marketing outlet for the majority of the small scale farmers and is therefore also the major supply source of maize used by rural consumers. Of late, the system has penetrated the major urban markets including Nairobi, Mombasa, Nakuru, Kisumu and other centres where it has become the major source of maize for the low income urban population who have increasingly found the maize and flour from the

formal market expensive. The sub-system is complex and consists of all types of traders ranging from small market or roadside operators to itinerary mobile traders who move varying quantities of maize on headload, donkeys, bicycles, or by hired or owned pick-up trucks and lorries. Before the short-lived market liberalisation (and again between October 1992 and October 1993 when the control mechanisms in the maize market were again back in place) the market traders have been limited by law on how much maize they could move and in most cases they risked being arrested and prosecuted for moving maize without a permit from NCPB. This again is another monopoly control mechanism the Board has had over the whole maize marketing system in the past.

In the 1970s and mid-1980s only two bags of 90 kg each could be moved without a permit from NCPB. When the Cereal Sector Reform Programme was launched around 1987/88 there was a gradual relaxation of the quantity of maize that one could move without a permit. First, the regulation was relaxed in 1988 to allow the movement of up to 4 bags per trip. Later, during the 1988/89 season the quantitative restriction was raised to 10 bags of maize per trip provided it was accompanied by the owner. The next relaxation in February 1991 increased the volume that could be moved without a permit to 44 bags and by April 1992, the volume was increased to a maximum of 88 bags per trip. As discussed in the later part of this paper, all these deregulation on maize movement were rescinded in October 1992 and the system was back to the two-bags movement restriction rule. The price control mechanism and the official setting of traders' margins especially in the formal maize and maize flour marketing channels were also re-instituted. Despite these restrictions, the informal marketing system has always been very active and is the only system that operates within the free market forces where supply and demand situation dictates the prices that prevail in all the transactions. The prices in this market are neither pan-territorial nor pan-seasonal as in the formal marketing system, but are allowed to exhibit spatial and seasonal variations. When local maize supply from farmers start to dwindle, most of the traders organise to get supplies from the maize surplus areas and take it to the deficit areas. When all the local informal maize sources run out of maize or become inadequate, the traders and some of the consumers have always turned to the NCPB for their supply and in that way help interconnect the formal and the informal sub-systems.

However, at times due to the past restrictions in the volumes that one could move in any given trip, the operational efficiency has been low since the traders have been unable to exploit economies of scale and reduce costs in carrying out such marketing functions like transportation and storage. The partial gradual liberalisation under the CSRP was intended to reduce these inefficiencies and to eventually lead to full market liberalisation. The full liberalisation was announced by the GOK on the 27th December 1993, just after this paper had been written.

It is still too early to evaluate the impact of the full liberalisation of the maize market. However, this paper has been revised lately to reflect this major reform. However, just as the final revision of the paper was being undertaken the GOK announced its intention to review the impact of Saps especially with respect to maize and sugar, possibly with a view to once again revert to the old market and price control mechanisms with respect to these two commodities.

THE MAIZE MILLING INDUSTRY AND MAIZE FLOUR SUB-SECTOR

Maize consumption in Kenya is mainly in the form of flour processed through milling. According to various estimates, (World Bank, 1990) about 75% of the maize consumed in the country is used in milled form. Basically there are three types of maize milling technologies currently in use in Kenya. The first type serving mainly the formal marketing system are the large scale mills found in the major urban centres. There are about thirty (30) such mills in the country specialising in producing mainly sifted maize meal. As noted already, when the maize market control scheme is on, these mills get their maize supply mainly from NCPB. Each of the mills must by law be registered with NCPB which again has to provide it with permits allowing it to sell its flour in specified markets.

The second type of maize mills are the medium and the small scale maize mills. It is estimated that there are about 200 such mills registered by the NCPB and producing whole maize meal and degermed maize meal. The third type of maize mill is the "posho mill" commonly found in the rural areas in market centres or in the low income sections of the urban centres. These mills normally provide milling services at a fee to consumers or traders who take their maize to the mill.

The maize milling sub-sector has a very strategic role to play in the maize marketing system especially in the process of market liberalisation. In the past partial market liberalisation, the large mills have been given quotas as to how much maize they could procure directly from farmers and private traders. Even at the time when maize movement restrictions were relaxed to a maximum of 88 bags or a 10 tonne lorry load per trip, the millers' margins in the formal marketing system and those of wholesale and retail maize flour traders have always been controlled through government set prices. Again, even the most recent partial liberalisation in October 1993 which re-instated the 88 bag limit suspended in October 1992 and which allowed free importation of maize, still retained the price and margin controls mechanism for the NCPB, the millers and maize meal traders. This stand has serious implications for millers and private traders who would like to procure maize locally or through import at free local or world market prices. Indeed some of the millers being close to the NCPB depots have so much depended on the NCPB for storage and transportation to the extent that most of them have not invested much in the facilities for providing these marketing functions.

THE STRUCTURAL ADJUSTMENT AND THE UNRESOLVED ISSUES IN THE MAIZE MARKET REFORM POLICY

The Cereals Sector Reform Programme (CSRP)

Most of the preceding discussion presents the analysis of the maize marketing system in the period before the marketing system was partially liberalised in 1991/92 or what the market reverted to when the partial market liberalisation and decontrol processes were halted by the government in October 1992 up to October 1993. All along in the past the GOK has dragged its feet on the issue of maize market liberalisation. As far back as 1974, the GOK had indicated a willingness to liberalise the maize marketing system as reflected in its policy documents and the official Development Plans (Odhiambo, 1988).

When the GOK and the EEC in January 1988 signed both the "Memorandum of Understanding" and the Programme Implementation Timetable for the EEC sponsored Gradual CSRP, many critics and policy analysts felt that the process of maize liberalisation in Kenya had started in earnest and would be completed at the end of the five year period as laid down in the signed documents. Indeed, the GOK in its 1988-1993 Development Plan categorically stated that the maize market would be fully liberalised by the end of the plan period (Kenya, 1988). The CSRP's stated objective was to support the GOK in realising its goals of strengthened food security for its people and the setting up of an efficient cereals marketing system with private sector involvement (Gray and Kariungi, 1991).

The CSRP also provided for the restructuring of the NCPB and market development as its major sub-components. Within the NCPB restructuring programme, the NCPB was expected to have a reduced role in the cereals market by ultimately remaining with limited commercial functions and performing the other social and statutory basic functions of being buyer and seller of last resort and holding of the strategic maize reserve. The NCPB was expected to be small but efficient at the end of the programme and that the costs of its market intervention unlike in the past, would be kept within well-defined budgetary limits through management re-organisation, reduction of buying centres, rationalisation of depot network and financial restructuring.

In terms of market development, CSRP implementation schedule was characterised by a phased approach to liberalisation of the maize market both at the primary and secondary marketing levels. At the primary level, the NCPB was to reduce the number of its buying centres network and replace them with a system of private buying agents and co-operative societies. Thus at the primary market level the CSRP planned to:

(i) have NCPB reduce the number of its buying centres and replace them with a system of buying agents;
(ii) involve and support co-operatives in maize purchases;
(iii) modify the system of maize movement permits with a view to eventually freeing maize movement; and
(iv) provide for registration of private traders to compete with co-operatives and the Board in the maize trade.

At the secondary market level, the CSRP sought to establish a system of control over millers' purchases with the view to eventually decreasing the share of the NCPB in the secondary market. In this respect, millers would eventually, at the height of full market liberalisation, procure the maize for their mills directly from farmers or traders without having to rely on the NCPB.

The CSRP Achievements and Setbacks

The implementation of the CSRP has not only been gradual, but it has also met with a few setbacks. The major achievements of the programme include the re-scheduling and subsequent removal of government control for such commodities like wheat, sorghum, millet and beans. Of great significance among these is the removal of all government controls in the

wheat and wheat product markets. The result has been the sharp rise in the prices of these products to the extent that the prices of raw wheat, wheat flour, bread and other related products have more than doubled between 1991 and 1993.

It is worth noting that as the CSRP was in progress the GOK under the Saps was also liberalising the markets of most other essential goods in the economy. Thus price control over such items like cooking fat, soap, detergents, and sugar were removed at the same time as CSRP was in progress. The devaluation of the Kenya shilling, coupled with the subsequent freeing of the foreign exchange market also under the Saps, has also meant the rise in prices of imported goods in the local market. All these changes, though at first sight may appear to have been complementing the CSRP, were in fact detrimental to the progress in the maize sub-sector reforms which were pushed back to full control again in October 1992. The rising consumer prices of the essential commodities was soon felt and when the price of maize in the free market started to rise to the extent of more than doubling in some areas of the country following relaxation of movement control, the government felt it had to intervene to protect the consumer at least as far as the maize staple was concerned. This happened in October 1992 when the GOK reverted to the old ban on maize movement by only allowing the movement of 2 bags or less.

As noted already, at the start of CSRP the movement restriction on maize was such that only 2 bags of 90 kg each could be moved by an individual. However, through the CSRP, the movement restriction had been relaxed, gradually starting in 1988 with allowing 10 bags to be moved by an individual, slowly rising to 44 bags (or 4 tonnes) by February 1991. In the early part of 1992, the movement of bags was further relaxed to allow 88 bags (or one lorry load). However, as poor weather in some parts of the country resulted in maize shortage and higher maize prices and as the added impact of rising prices of decontrolled essential commodities under the Saps started to be felt, the government slapped a ban in October 1992 on the movement of maize country-wide again. The ban lasted one full year, and was lifted again in October 1993, allowing again free movement of up to 88 bags of maize. At the same time private importation of maize was also allowed.

Most participants in the maize market were still debating whether this time around the partial liberalisation would last without another policy reversal, when suddenly on December 27th 1993, the GOK announced the full liberalisation of the maize market. The surprise announcement of the long awaited full liberalisation of the maize sub-sector was received with mixed feelings among traders, millers and consumers. The maize traders and some millers welcomed the move while consumers became very apprehensive about the prospects of the escalation in the prices of maize and maize meal. Indeed the price of maize and maize flour had increased by almost 50% since the full liberalisation was announced. At the time of revising this paper the GOK was again worried about the high prices of maize and maize flour and was seriously thinking of reviewing the impact of the Saps on the sub-sector.

Issues Still Unresolved

The major issues still unresolved in the maize trade in Kenya are:

(i) Will the GOK permanently allow full decontrol of the maize marketing system judging by its past policy reversals during the partial liberalisation process and the present (May 1994) concern with rising maize prices following the recent full liberalisation?

(ii) What will be the ultimate role of NCPB in a liberalised maize market in Kenya? and

(iii) Can the Kenyan private sector be relied upon to handle the marketing of such an important staple like maize without wide-spread detrimental social implications? These are some of the questions that policy analysts and policy makers must try to answer.

The GOK, however, has stated in many of its policy documents that it is committed to ultimately liberalising the maize market and finally having the NCPB as buyer and seller of the last resort whose functions will be limited to reduced commercial maize trade, maintenance of strategic reserve stock and market stabilisation. While the GOK policy statements seem to favour maize market liberalisation, it is not hard to see that policy makers tend to drag their feet in the implementation of these policies.

There is the ever present fear among the policy makers that:

(i) The marketing system is quite underdeveloped and a few unscrupulous traders with easy access to finance can exploit both producers and consumers;

(ii) The private sector being profit oriented may not market maize to the remote vulnerable areas where shortages are likely to occur more frequently;

(iii) Private traders in their profit oriented exploitative tendencies will neither guarantee price incentive to farmers nor offer stable prices to consumers; and

(iv) The private sector may not invest in infrastructural facilities required for the maintenance of the maize strategic reserve for the country.

If these fears persist in the minds of policy makers then the commitment of the government to the liberalisation of the maize market must also mean that the NCPB will remain a major participant in the maize marketing system perhaps with redefined role. Indeed under the CSRP, the NCPB was supposed to have a reduced market share by performing limited but profitable commercial functions and also performing the social but unprofitable functions of maintenance of strategic reserve and stabilising the market. The latter function being a costly exercise was supposed to be performed under special contract funding by the government (Gray and Kariungi, 1991). The full liberalisation of the maize market announced in December 1993 followed after consultations with the World Bank regarding resumption of aid funds which had been suspended for about two years. No adequate provision was made for the redefined role of the NCPB.

Another pertinent issue in the liberalisation of maize trade is that of whether or not the private sector is really prepared to take up maize trade efficiently and without exploitative

tendencies. The private sector, even before the partial liberalisation, controlled through the informal marketing channels about 70-80% of maize traded in the country (Odhiambo, 1988; Barclay, et. al. , 1989). Indeed this has been a counter argument put forward by those who do not want NCPB's role in the market reduced. However, it must be noted that most of the informal maize trade during the control periods has been dominated by small scale traders whose impact on the market, if at all, was due to their sheer numbers rather than their scale of operations and efficiency. The movement restrictions and price controls that have been the tradition in the market have not encouraged the development of large scale trade and private sector investment in the provision of physical facilities. The market has, therefore, accommodated and perhaps inadvertently encouraged inefficiency.

Whether or not the private sector will take up the challenge and invest in the maize trade will depend on how confident they are that the government is serious about liberalisation. Past policy reversals where controls were removed only to be re-instituted have made potential investors in this sector become sceptical at least in the short-run about policy pronouncements regarding liberalisation. Large scale millers and traders, for example, have had problems deciding to what extent they could invest in terms of storage and transport facilities in response to the liberalisation policy. The free market cannot develop in a situation where private investment in market facilities is not forth coming.

According to the Memorandum of Understanding signed between the GOK and the EEC, the CSRP was meant to achieve a phased progress in reforming the grain market. In the maize market sub-sector, the programme was expected to improve the efficiency of the NCPB while at the same time accommodating a gradual decontrol of the private maize trade without inducing abrupt disruptive changes in the system (Gray and Kariungi, 1991). This gradual approach to liberalisation of the maize marketing system seemed to have been more appealing to the GOK than the more radical approach of immediate and straight liberalisation of the system as pushed for by the World Bank and the IMF. The CSRP as laid down was more acceptable to the GOK because it recognised that although it is easy to argue that a free market system would in theory be both more efficient and more equitable, it is quite another matter to chart a course of policy that would achieve that goal without disrupting other sectors and the social set-up.

The on-again-off-again history of the CSRP suggests that the GOK, although responding to the pressure (mainly from the World Bank and other donors) pushing for a quicker pace to full liberalisation, could not ignore the pressure against it such as the local politics of rising food prices, oligopolistic sectors with political influence, poor investment climate and poorly organised private sectors in key rural areas that could lead to exploitation of both farmers and consumers of maize. As noted by Pearce (1992), it should be pointed out that while Structural Adjustment Programmes entail a strong commitment to changes in the three areas of policy dealing with Administrative Controls, Institutional Reforms and Prices, they seldom detail implementation procedures regarding optimal timing and sequencing of change. The World Bank, through their SAP prescriptions, often ensure that the implementation should be taken on all fronts, simultaneously, although experience elsewhere has shown that this may not always be feasible.

CONCLUSION

The process of maize liberalisation has been gradual and uncertain in terms of government commitment. The saps and CSRP have presented the policy makers with a dilemma in the maize market. As things stand now it appears until that time that the GOK is convinced that the marketing system is well developed and devoid of exploitation or until that time that the NCPB has its systems of strategic reserve and market stabilisation in place and functioning properly, we may not see a completely free maize market.

Policy reversals that have been seen in the past may still occur in case the government perceives what it regards as imperfections in the market. Indeed even before the announcement of full liberalisation in December 1993, the then partial liberalisation announced in October 1993 whereby 88 bags could be moved freely and allowing private maize importation, still left the price control in the formal market intact. The NCPB maize producer price and its selling price were at that time still controlled and included some elements of subsidy to the consumer. The same applies to the flour millers' and traders' margins and consumer flour prices. The recent short-term SAP impact on prices both for inputs and for the essential consumer items is a real scare to the policy decision makers in Kenya. Thus although the GOK, through policy statements, appears to be committed to the eventual full liberalisation of the maize market, the implementation of such stated policy objectives have proved difficult. Just as the industry was beginning to adjust to the recent full liberalisation, the government has just started giving mixed signals by its current pronouncements about reviewing the negative impacts of the liberalisation of the maize market and other essential consumer items on the average consumer.

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4.3

AN INSTITUTIONAL ANALYSIS OF THE EVOLUTION OF DAIRY POLICY IN KENYA AND ETHIOPIA: FROM MANAGED PRODUCTION TO STRUCTURAL ADJUSTMENT

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INTRODUCTION

Achieving food security is dependent on economic development and good policies. Livestock production can be a major contributor, both driving economic growth and benefiting from it. The historical development experience shows that even as the importance of agriculture to total output declines during economic growth, the importance of livestock production in agriculture increases. Whereas the contribution of agriculture to total GDP is about 50% on average in low-income Africa, it is only about 25% on average in Asia, and about 12% in Latin America. In the industrialised, high-income countries of Europe and North America it averages only about 4%. Livestock products in developing countries, meanwhile, make up an average of 26% of recorded agricultural output (meat, milk, eggs, wool, hides, skins), but 55% in developed countries. Increases in livestock supply can provide better nutrition, as well as increased income, employment, and foreign exchange earnings, thus adding measurably to food security.

On the other hand, rapid population growth, urbanisation, and increasing incomes cause the demand for animal products to increase during the process of development, and this demand increases more than proportionately and at a higher rate than cereals. Of all the regions of the world, sub-Saharan Africa is growing most rapidly with annual population growth rates in the 1990s projected to be 3.1% (World Bank, 1990). Moreover, shifts in population to urban areas are occurring and urbanisation tends to shift dietal preferences to foods of higher quality such as meat, milk and eggs. To achieve food security, then, increasing livestock production is essential.

Consumption of milk products, meanwhile, increases even more rapidly than meat as development takes place. Market-oriented, demand-driven opportunities for dairy production growth thus exist wherever population concentration is taking place. This is especially true in the East African highlands where comparative advantage for dairying exists. Demand for dairy products is likely to rise significantly in Eastern Africa for the foreseeable future.

The potential role of dairy in achieving food security can be greater than it would at first appear. Whereas the livestock sector in sub-Saharan Africa accounted for only 18% of agricultural GDP in 1989, milk production made up about 20% to 25% of this total, or an estimated US$ 1.75 billion (FAO, 1990). Moreover, while dairy products supply only 2% of calories and 4% of protein in human diets, they account for an estimated 11% of food production by value on average in sub-Saharan Africa. In Kenya, which is indicative of dairy

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production potential in the East African highlands, this figure is 16%. Dairy production can thus be important in achieving food security in three ways: 1) directly through increased food production that adds directly to household nutrition; 2) indirectly through increased cash income that can be used to purchase food, as well as other household items; and 3) through employment generation. Because of its multiple influences on household welfare, dairy provides a good example of how policies can promote or constrain food security.

PROBLEM STATEMENT

Structural adjustment and policy reforms aim to be supply-enhancing and hence promote food security. This paper uses examples of the evolution of dairy policy in Kenya and Ethiopia to illustrate how policy reform can be subverted during the policy formulation and implementation process. In line with structural adjustment, liberalisation of dairy prices has been the primary means of policy reform in these two countries. The paper examines whether price liberalisation alone is enough. Institutional factors such as ambiguous regulations and the inefficient functioning of institutions can lead to the subversion of policy formulation and implementation by vested interest groups and thus prevent intended policy impact, including enhanced food security.

The potential of smallholder commercial dairying in Kenya and Ethiopia has led to efforts by national leaders and donors towards promoting this activity. In both countries, the policy emphasis on the supply side is now on support for increasing smallholder production. Along with the other major policy goals of satisfying urban demand and meeting consumer nutritional requirements, this emphasis on encouraging smallholder production has largely shaped public dairy policies. Whether policy has been formulated and implemented in a way that these policy goals of supporting both consumers and producers could be simultaneously achieved is an issue that is common to most agricultural commodities.

To achieve the demand-side goals of supporting consumers, programs that have seen the development of formal milk channels to encourage smallholder production and bring dairy products to urban consumers have been emphasized. The policies and programs enacted, however, have not impacted smallholders to the degree intended. Studies have shown that in Kenya, disincentives to producers exist despite the stated policy goal of supporting smallholders[1] , and in both countries smallholders have tended to divert production to informal markets. Even though liberalisation of price policies has occurred in both countries, this clearly has not been sufficient to bring about desired results. As this paper will show, policy formulation and implementation can be subverted by opposing interests, or hindered by institutional or resource constraints.

This paper examines the evolution of dairy policy in both countries and, using a conceptual framework to analyse institutional constraints to policy enactment, identifies factors which diverted policy impact from national goals. The lessons learned can be applied to improving existing and future dairy policy. The first part of this paper briefly conceptualises the process of policy formulation and implementation and identifies the types of factors which

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1 See Staal and Shapiro, 1993.

influence their outcomes. This discussion is motivated by and extends the work of Thomas (1981) and Grindle (1980). The paper then traces and compares the evolution of dairy policy in Kenya and Ethiopia. Finally, the two country cases are considered in the light of the conceptual framework, and the major institutional obstacles to policy impact are identified. Implications for continuing policy are highlighted.

CONCEPTUAL FRAMEWORK

The process of food policy delivery can conceptually be broken down into two basic stages, a) policy formulation and b) policy implementation. A variety of factors can influence the formulation of policies and their stated objectives, as well as the means and effectiveness of policy implementation. The practical effect at the end of the policy process may thus be quite different from policy-makers intentions. Although the steps which make up policy formulation and implementation might in some cases overlap, they can be summarised in the following way:

Policy Formulation

Food policy formulation normally is formally carried out by senior government officials (although often acting on drafts written by subordinates) and usually involves choices between alternatives. These choices include a) policy goals which reflect national priorities, such as enhancing consumer nutritional intake, b) policy strategy, including selection of the mix of price, regulatory and project policy instruments, and c) implementation strategy, including choice of implementing ministries, timing of interventions, and relative emphasis between the policy instruments. Formulation may also involve the creation of new institutions, such as agencies needed to administer new dairy development programs. These various choices determine policy content, with resulting implications for the various interest groups. These factors will be seen to have been critical in determining the outcomes of dairy policy in Kenya and Ethiopia.

During policy formulation, choices must also be made about resource allocation. These choices determine the distributional consequences of policy on the welfare of target groups and individuals. Resource allocation results in the nature and level of opposition or support to implementation efforts. Finally, to be successful, the formulation process must conclude with two outcomes: a) the formal expression of the policy objectives and strategy for implementation, and b) the accordance of authority to those individuals and institutions designated to implement the policy strategy.

Policy Implementation

Once policies have been decided, implementation occurs through policy instruments. For any given policy, these instruments range from regulatory or price interventions to the allocation of resources and the creation of new institutions for the delivery of the policy. This stage of policy delivery is carried out by an entire spectrum of officials at all institutional levels and locations. Implementation sites are also chosen, and specific resource allocation takes place at this stage. Critical to the success of implementation are a) the development of

communication links between various implementing agencies, the b) creation of incentives to maintain civil servant morale.

Factors Affecting Formulation and Implementation

During both stages a variety of factors can affect policy outcomes. It is useful to distinguish four categories of factors:

1) interest groups including donors, civil servants, producers, consumers, and processors;
2) policy content, particularly with respect to its distributional consequences and the degree of behavioral change required by policy targets;
3) institutional functioning, resulting from authority structure (whether diffuse or centralised), interministerial links, and degree of policy formalization; and
4) resources, including both financial and human resources.

How these factors have influenced the evolution of policy in Kenya and Ethiopia will be considered in the following two sections.

Brief Review of Kenyan Dairy Evolution[2] .

Three separate eras of dairy policy can be distinguished in the evolution of the dairy industry in Kenya:

1) In the first period, from the turn of the century until the late 1950's, production and processing was dominated by a small group of large settler farmers, who used introduced technology and animals in a highly managed industry. Through their processing and marketing co-operative, the Kenya Co-operative Creameries (KCC), and its quota system, they were able to restrict entry by new producers and increase revenues to existing ones. They were also able to influence official policy so as to advance their own interests, by pressuring for regulations which restricted ownership of exotic animals, and also restricted licensing of processing and access to urban and export markets. Perhaps most importantly, these large producers were able to set policy themselves, by controlling all the formal processing of milk products.

2) During the second period, which began around independence and lasted until the late 1980's, policy began to support the interests of smallholders. While the development of rural dairy co-operatives and extension services did indeed increase smallholder production, a disproportional amount of the benefits still accrued to the KCC. While the dominance of the large producers had declined, the KCC became a policy interest in itself, and successfully advanced its own interests by influencing official legislation. During this period, it successfully

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2 For more on Kenya dairy industry, see Bates (1989), Danida (1991), Heyer (1981), Mbogoh (1987), Mbogoh and Buteyo (1981), Raikes (1961), and Riungu (1976).

defended two attempts at nationalisation. Smallholder interests thus remained only partially addressed. In spite of this, smallholder production remained a profitable activity and came to dominate milk production in the country.

3) With the moves towards greater economic liberalisation in the late 80's (and despite the effective nationalisation of the KCC), the prospects for smallholder producers seem even brighter. All dairy prices have been decontrolled, leading to increased smallholder revenues. Growing competition in dairy processing suggests rents still exist and market opportunities and higher producer profits remain to be realised. The present policy allowing the market to determine prices and production levels should be in the interests of the smallholders.

Brief Review of Ethiopian Dairy Evolution[3] .

1) The first era under the imperial regime, from the 1950's until early 70's, saw the growth of large indigenous commercial farmers in peri-urban areas. The development of a formal parastatal processing and collecting facility in Addis Ababa contributed to this growth. The advantage of the large producers lay in their ability to produce milk using a land resource base, and then market it in informal quantity or, via subsidised parastatal transport, to the formal market. Smallholders at that time generally did not have access to improved cattle but began to produce for the urban demand. The policies which were critical during this period were thus subsidised milk collection (resulting in a formal producer price comparable to the informal market price), assured land tenure, and open markets for feed and other inputs. Veterinary and AI services were developed to support this process of development. The strongest interest groups affecting policy during this period were donors, national policy-makers, and large indigenous producers.

2) The period under the socialist regime, from 1974 until 1991, was characterised by only nominal support for smallholders. Actual support in Ethiopia was for unprofitable state farm production. One result was that production shifted to smallholder urban (backyard) producers who marketed directly and informally to consumers. They were best able to avoid or withstand the effects of policies which brought about land tenure uncertainty, feed supply restrictions, and reduced formal producer prices. The supply of milk to the processing parastatal shrank to well below capacity, derived mainly from state dairy farms and produced and processed at high cost. The smallholder producers who supplied most of the milk actually marketed were ignored by all policy intervention. Lacking membership in rural Peasant Associations, they were not recognised as a policy target group. Although urban smallholders operated under difficult circumstances during this time, they affected the outcome of policy implementation through their ability to divert milk supplies to the informal market.

3) Finally, under the present structural adjustment program, Ethiopia is beginning to liberalise its dairy policies. Formal producer prices have risen, but state farms remain the main suppliers to the formal sector, which continues to incur losses. Feed policies are beginning to be liberalised as well. The opportunities for smallholder producers, who now hold most of

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[3] For more on Ethiopian dairy industry, see Empson and Westerduin (1984), FAO (1972), Mbogoh (1984), Purcell and Stotz (1980).

the cross-bred cattle, seem substantially better than before. Urban and peri-urban producers have organised themselves into a Dairy Producers Association, with the primary objective of improving their supply of feed and veterinary drugs. Further, small-scale entrepreneurs are increasing the marketing of fresh milk and dairy products, thus improving the marketing opportunities open to smallholder producers.

Analysis of Policy-Influencing Factors Policy formulation and competing interest groups

Interest groups are likely to exert the most influence at the policy formulation stage. These include the policy-makers themselves, the other government officials who will implement policies, producers and consumers affected by policies and the donors who fund policy implementation. Aside from national welfare interests, each group aims, to some extent, at enhancing their self-interest, often in the form of opportunities for a) career tenure and promotion and/or b) resource allocation.

In Kenya during the early dairy industry, settler farmers were able to merge their creameries to control formal processing, market entry and prices. In effect, they created market and price policy, which further allowed them to influence the colonial government and to legislate licenses and regulation to protect their access to urban and export markets. All other interests at this point were sidelined. After independence, the processor with monopoly power to control marketing, the KCC, subverted the move to support smallholder producers by inviting some politically influential African producers into its membership as stockholder. They were thus able to avoid two attempts at nationalisation, and at the same time maintain legislation which allowed them complete control of the formal dairy industry. More recently, donors' influence on dairy policy has made itself felt, with changes to market access and price policy based on donor recommendations for liberalisation.

Early Ethiopian dairy policy was largely established by donors, who created the base for a formal market, and large farmers with political access and capital. Although policies enhanced opportunities for smallholders, distinct advantage was maintained for large producers. With the coming of the socialist regime, policies were determined based on ideology by senior policy-makers. Even though policies nominally supported peasant producers, they had no role in policy formulation. In the present era, Ethiopian dairy policies are not yet clearly defined, but are being influenced by donor desires, and, to some extent, the managers of parastatal dairy institutions. In spite of their new Association, producers seemingly have little voice at the formulation level.

While influence at the policy formulation stage in Kenya has resulted from the market power of large farmers or the KCC, reflecting the more developed market economy, political or ideological elements in Ethiopia have had a greater impact. In both countries now the external influence of donor ideology has gained considerable strength. In neither country did smallholders ever have much voice in policy formulation.

FORMULATION AND CONTENT

Closely related to interest factors in policy formulation is the influence of the content of food policy, particularly regarding the distribution of benefits resulting from policy content. Policies which introduce changes in economic relationships are likely to be more difficult to formulate, as they will attract both stronger opposition and support. An important distinction exists between policies providing a) collective or diffuse benefits and b) those providing benefits which are more focused. In both Kenya and Ethiopia since the replacement of the colonial and imperial regimes, it has been difficult to institute dairy polices which raise producer prices (and, by implication, consumer prices), even when such moves have been recognised to be desirable. Not only would such policies benefit a relatively small group of individuals, but the costs would be born by a diffuse group of dairy consumers. For the same reason, a dairy producer credit policy collapsed in Ethiopia when it was determined to be politically untenable for a few individuals to benefit in a collectivising economy.

Associated with policy content is the decision as to which institutions should implement the programs. If policy is such that several ministries have some interest, confusion of decision sites and policy fragmentation can result. In Kenya during the 70's, responsibility for dairy levy collection was shifted several times between the KCC and the Kenya Dairy Board (KDB), while licensing remained with the KDB. In Ethiopia, management of the processing parastatal (DDE) remains under the Ministry of State Farms, while dairy development responsibilities are retained by the Ministry of Agriculture (MoA).

Problematic policy content can thus result in appropriate policy steps being avoided, and existing policy responsibilities being fragmented between independent but related institutions.

FORMULATION AND INSTITUTIONAL FUNCTIONING

The effect of institutional functioning on policy formulation during the decision-making process may be due to it not being sufficiently formalised. As a result, clear authority for policy decisions may be uncertain, allowing de facto policy decisions to be made by unauthorised institutions or authorities. In Kenya in 1970, the Dairy Working Party was convened by the government to consider policy recommendations, including the contentious issue of banning non-KCC private dairy processing. While still meeting, the KCC, not officially a policy-making institution, unilaterally announced the ban. This move was not challenged. In Ethiopia recently, some managers of food mills supplying livestock feed began independently altering the policy of selling feed only to licensed producers. This move was not authorised, but based instead on an informal interpretation of national policy moves towards liberalisation. Other managers in neighbouring mills continued to adhere strictly to the previous policy. Licensed dairy producers began experiencing difficulty finding feed at some plants.

Institutional functioning at the policy formulation level can thus result in conflicting signals to the intermediate officials who must implement policy, or actual subversion of designated policy-making authority.

FORMULATION AND RESOURCES

Curiously, resource constraints often have little effect in influencing decisions at the policy formulation stage. The Kenyan Dairy Working Party set out the objective of tripling dairy production over the next 20 years, while at the same time reducing the land resources used by dairy. The lack of resources to carry out such objectives does not detract policy makers from the seeming importance of stating them.

In some cases, resource allocation decisions can drive policy choices, rather than the reverse. Recently in Ethiopia, the only official body implementing dairy policy has been the Dairy Advisory Board (DAB), made up of senior ministry officials. The only official function of the DAB is to allocate the funds generated by sales of WFP-donated milk powder. Although the DAB is not authorised to create policy, since these funds constitute the major resources available for dairy development, their allocation in effect determines policy strategies. In this case, resource allocation is driving policy.

In short, lack of resources may not constrain the setting out of particular policy objectives. However, the availability of resources, in some cases targeted in particular directions, can drive policy strategies.

IMPLEMENTATION

The policy instruments resulting from the formulation stage are usually put into place in action programs, which may be disaggregated further into projects. Programs to promote smallholder dairy have resulted in the creation of the Dairy Rehabilitation and Development Project (DRDP) in Ethiopia and the RDDP and the National Dairy Development Project (NDDP) in Kenya. Policy implementation is directly dependent on program implementation.

In the implementation stage, the same factors play a role, although now their relative influences are different. Such factors account for an "often imperfect correspondence between policies adopted and services actually delivered" (Grindle, 1980, p.3). Furthermore, it is important to try to separate the outcomes of policies from those of their policy instruments because program failures may not necessarily indicate policy failure. Programs may not be appropriately geared to policy goals.

Implementation and interest groups

Since implementation involves the final delivery of policy, it inherently involves fundamental questions of conflict, sharing, and "who gets what." The role of interest groups may be even stronger at the implementation stage than during formulation, particularly given the lack of formal voice of many groups at higher levels.

Among officials, the role of intermediate and subordinate civil servants becomes particularly strong at the implementation stage. Programs which ignore formal or informal incentives to civil servants risk program blockage, while those which overly compromise resources to reward officials may be constrained materially. The development of state dairy

farms in Ethiopia was critically impeded by overly centralised and bureaucratic decision-making. The resulting low morale of farm managers has led to poor animal management and diversion of farm resources. The result was a complete failure of the most important dairy policy strategy of the socialist regime.

Perhaps the strongest influences at the implementation level are those targeted by policy. While in both Kenya and Ethiopia smallholders had no say in price policy formulation, in both countries they were able to subvert those policies by diverting their supply to the higher-priced informal market. In 1992, Kenyan smallholders were effectively able to force a change in public policy by this means. They diverted so much supply to mainly informal channels for peri-urban demand that severe shortages began occurring in the urban areas which depend on formal supply. The government was forced to decontrol dairy prices, leading to an immediate rise in the producer price. Urban milk supply immediately increased. Disincentives to supply the formal market also exist in the form of delayed payments to producers, and excessive co-operative marketing margins, resulting in low producer prices.

In Ethiopia, where milk demand is primarily urban, some 70% of the demand is supplied by smallholders directly and informally to urban consumers, and the formal parastatal remains crippled by unutilized capacity. This is a result of a price policy which set formal prices at less than half the price available to producers on the informal market.

Implementation and content

The difficulty in implementing policies that require behavioral change has affected the success of programs directed towards improving dairy management and technology. Although the NDDP project to promote zero-grazing and forage production technology in Kenya has shown some results, it has required extensive and regular intervention by field workers directly with smallholder producers. The successes achieved have been motivated by land shortages in peri-urban areas, which has provided natural incentives for producers to adopt zero-grazing techniques, as compared to land surplus areas where farmers have resisted change.

The Ethiopian DRDP project, and the MoA forage development program, both with similar objectives, have had little impact. They attempted to work through the socialist regime's Peasant Associations, rather than directly with producers. Further, they completely ignored the majority of commercial producers, who are based in the urban area. Implementation requiring behavioral change in dairy production must, therefore, be targeted directly at producers, and be designed so as to be consistent with resource endowments and the market incentives that already exist.

Implementation and institutional functioning

Within implementing institutions, decision-making authority and responsibilities for implementation may not be focused enough to have impact. The Ethiopian Dairy Advisory Board has failed for nearly 10 years to allocate most of the WFP resources at its disposal, its sole function. It is perceived that this problem exists because, although the group is made up of

senior ministry officials, real decision-making power lies higher up, and clear policy strategies are not adequately communicated to the Board.

Remarkably, clear communication of policy specifics is a common institutional constraint to effective implementation. Formal dairy producer prices were only raised in 1993 when the manager of the dairy parastatal read in the newspaper that the government supported increased producer prices. Such communication problems occur particularly in ideologically-charged environments where officials may be reluctant to commit policy decisions to paper, preferring instead to use informal channels.

Implementation and resources

Human resources within implementing institutions may pose a larger constraint to implementation than financial resources. A central element of Kenyan dairy pricing policy has been the authorisation for dairy co-operatives, who collect the milk, to deduct their costs from producer prices. Co-operatives have thus been allowed to deduct a margin to cover their actual costs, which have varied widely based on the level of managerial skills and financial control. Thus, although the stated policy was to enforce a uniform national price, differences in human resources between co-operatives have resulted in farm-gate prices which sometimes have varied by as much as 100%.

CONCLUSIONS

The major dairy policy failures in both countries can be identified as resulting from, and requiring:

1) During policy formulation the lack of clear decision-making responsibilities has allowed institutions with economic power to determine policy strategies, or has simply resulted in poor policy formulation. This factor allowed the KCC to maintain legislative advantages for 20 years even after the resulting harm to producer welfare and the dairy industry was recognised. In Ethiopia, where decision-making authority has not adequately been vested in the Dairy Advisory Board, the only official dairy body, dairy policies continue to be vaguely addressed, resulting in poor allocation of available resources.

2) Similarly, implementing authority must be clearly accorded. The KCC's influence was greatly enhanced by its ability to subvert the nominal regulatory role of the KDB. As a result, licensing functions have been ineffective. In Ethiopia, the implementation of dairy development programs has been impaired by fragmented responsibilities.

3) Communication of specific policy strategies must be formalised. This has been particularly evident in Ethiopia, where the efficiency of the feed market remains impaired, and dairy pricing policy uncertain, as a result of a lack of clear policy communication.

4) Implementation will only occur effectively if intermediate and lower-level officials have the necessary incentives and training to carry out required tasks. Poor performance has

hindered good performance of the dairy co-operatives in Kenya, and has crippled state dairy farms in Ethiopia.

5) Implementation will only occur effectively if policy target groups (mainly dairy producers and marketers) are dealt with directly, and provided with incentives which induce them to cooperate with policy intervention, and which are complementary to existing resource conditions. The diversion of supply by smallholders to informal markets in both countries is a result of a lack of these conditions. The inability of dairy development schemes in Ethiopia to have impact has resulted partly from insufficient direct contact with producers.

6) A voice for policy target groups, namely smallholders, is necessary in policy formulation if appropriate strategies are to be achieved. This could serve to help overcome the difficulty of adopting producer-oriented pricing and other types of policies.

Both Ethiopia and Kenya share the same broad policy goals of increasing dairy production, and providing clean milk to satisfy urban demand.

These require two basic thrusts:

a) promoting smallholder commercial milk production, and
b) channelling that production to the formal market.

No attempt to revitalise the formal market in either country will succeed without policy measures intended to "capture" the informal supply, by providing incentives for smallholder producers to join the formal market. While early in 1992 the KCC was selling some 400,000 lt./day of fresh milk in the Nairobi area, sales by May 1993 had fallen to about 240,000 lt./day despite price policy liberalisation.

Although Kenyan dairy policies have been influenced by groups working towards economic rather than ideological goals, legislative changes have removed only some of that economic power and thus provided smallholders with more profit but less than their potential in the formal market. Ethiopia has only begun to move in the direction of market reforms, after several decades of ideologically-driven policies which, although espousing the welfare of smallholders, in reality ignore many of them. Ethiopia's tentative steps towards liberalisation begin to provide an environment for incorporating smallholders in the formal market.

Major long-term dairy policy goals of both Kenya and Ethiopia have been satisfying urban demand and meeting consumer nutritional requirements, while encouraging smallholder producers has become a policy goal more recently. This emphasis has largely shaped public dairy policies. To achieve the first two consumer-oriented goals, programs that seek to develop formal milk channels to bring smallholder production to urban consumers have been emphasized. The policies and programs enacted have not impacted smallholders in the way intended. Since policy has not been able to ensure marketing of most dairy products through formal channels, this has limited the ability of both governments to control distribution and achieve its consumer-oriented policy goals, including having a major effect on food security. Successfully formulating and implementing dairy policies which bring smallholders into the

market, and thus work towards common national food policy goals, depends on eliminating the contrary affects of institutional, interest group, and resource factors.

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4.4

AGRICULTURAL POLICY, FOOD SECURITY AND SOCIALISM IN ETHIOPIA

Demese Chanyalew[a]

INTRODUCTION

In the past two decades, inappropriate government economic policies have made Ethiopia's economy decline, more so in agriculture. The decline of agriculture means a collapse of the national economy. These policies exacerbated the problems of food shortage and malnourishment which have existed for years due to continuous war, drought, famine and epidemics.

This paper first briefly discusses the performance of Ethiopia's agricultural economy and food situation in the 1970s and 1980s, i.e., the socialist era, starting in 1974--the year of the revolution. This is followed by a discussion on agricultural trade. Finally, an attempt is made to identify some of the major causes of Ethiopia's economic decline in the past two decades.

AGRICULTURE AND FOOD

The change in economic structure, measured by the change of different sectors percent share from Gross Domestic Product (GDP), shows that no change in economic structure took place in Ethiopia in the past two decades. Ethiopia's economy is still agricultural. Over the years agriculture's share of GDP ranged between 40 and 50 percent (Table 1). From the total economically active population, 74.5 percent is making a living from agriculture (Table 2), suggesting this sector is still the major source of employment in the economy. Agriculture in Ethiopia is not only the source of internal revenue and foreign exchange for the expansion and investment in the agriculture sector, but it is also expected to be a source of funds for the creation and expansion of industries in manufacturing, transport and communication and other sectors. In the past two decades, instead of being a source of funds for the development of other sectors, agriculture has not even been able to support its own development. As a result Ethiopia's economy declined with the decline in agriculture.

In 1966/67 (1958 and 1959 E.C) the population was about 23 million. In these two years the average land under *`teff*[1] production was 2.1 million hectares. By 1988/89 (1980 and 1981 E.C) the population increased to about 50 million but the land under teff production decreased to 1.3 million hectares (Table 3). Though teff yield per hectare increased from 6 to 8.1 quintal, the total production decreased by 18.4 percent. The prevalence of a big shortage of teff has led to an exorbitant price in recent years. By 1988/89 the price of a quintal of teff was about fivefold compared to the 1966/67 period, particularly in urban areas. The shortage was

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[1] Teff is the staple grain crop in Ethiopia which is used to make the traditional food called `Enjera'.

caused predominantly by agricultural policies which contributed to the misallocation of resources in the production sector. This trend was also typical in other food and oil crops production.

Table 1. Percentage Sectoral Share of GDP for Selected Years[a].

Sector	1964	1968	1972	1974	1976	1978	1980
Agriculture[b]	51.7	50.1	51.0	49.0	45.5	44.8	42.2
Mining/Quarry	0.2	0.2	0.1	0.1	0.1	0.2	0.1
Manufacturing	5.0	5.7	7.0	7.0	7.5	7.4	8.0
Handicraft &Small Industry	5.0	5.0	3.9	3.8	3.8	3.6	3.7
Building and Construction	5.0	3.4	3.9	3.9	4.3	4.1	4.1
Electric/Water	0.8	0.7	0.7	0.7	0.8	1.1	1.4
Whole Sale and Retail Trade	8.9	10.2	10.6	10.8	11.2	10.7	10.4
Transport and Communication	5.5	5.1	4.6	5.4	6.3	7.4	7.1
Bank/Insurance & Real Estate	1.7	2.6	3.2	3.4	3.2	3.5	4.4
Public Adminstration/Defence	5.5	6.6	6.6	7.4	8.4	8.0	8.9
Service/Others[c]	10.7	10.4	8.4	8.5	8.9	9.2	9.7
TOTAL	100	100	100	100	100	100	100

Source: Statistical Abstracts of Central Statistical Office and Quarterly Bulletins of National Bank of Ethiopia, prepared by Economic Research and Planning Department.

a. Ethiopian fiscal year.

b. Includes agriculture, forestry, hunting and fishing.

c. Includes educational, medical and health and domestic services as well as ownership of dwellings and others.

Table 2. Economically Active Population, Total and percentage in Agriculture for selected Years.

	Population		Economically Active Population	
Year	Total (millions)	Agriculture	Total (millions)	% in agriculture
1962/63 E.C (1970)	30.6	26.0	14.4	85.0
1967/68 E.C (1975)	34.3	28.3	15.9	82.0
1972/73 E.C (1980)	38.7	31.0	17.7	80.0
1977/78 E.C (1985)	43.1	33.2	18.8	77.3
1982/83 E.C (1990)	49.2	36.7	20.7	74.5

Source: FAO Year Book, Production, 1985 and 1990.

Note: E.C.- Ethiopian Calendar which run from September to August. For example, 1986 E.C is 1993/94, i.e., from September 1993 to August 1994.

The first decade after the revolution shows that while population increased by more than 50 percent, the total land area for the production of various crops (for 8 of the 10 crops presented in Table 3) declined in a range of 6 to 32 percent. For example, land for wheat and linseed cultivation declined by 17.4 and 32 percent respectively. Although land under wheat production declined, total production increased by 22 percent.

The two years average yield of wheat for 1973/74 (1965 and 1966 E.C) was eight quintals and in 1983/84 (1975 and 1976 E.C) was 11.8 quintals per hectare. However, when yields increased, the per capita production of wheat declined by 21 percent in ten years time after the revolution. On the average the per capita wheat production in 1973/74 was 24 kgs. In 1983/84 the per capita production declined to 19 kgs., indicating that though total wheat production increased, in effect from the population growth point of view, there was a shortage of wheat in the nation.

In general in the 1970s and early 1980s food production in Ethiopia lagged behind population growth. During this period, according to World Bank estimate, agricultural production had grown by only 1.1 percent a year, while the population had increased by 2.5 percent (World Bank, 1984). In recent years, reports on the food crops situation in Ethiopia show that the per capita availability is below the international standards. At the beginning of the 1980s, after allowing for seed and post harvest losses, per capita consumption of food in Ethiopia was 178.8 kg -- equivalent to 1,728 calories of nutrients per day or 82 percent of the recommended norm of 2,100 calories. In the three year period, 1986 to 1989, the estimate of average per capita availability fell to 163.9 kg per annum, equivalent to 1584 calories per day, or 75 percent of the recommended norm (World Bank, 1990).

After the revolution, in addition to little change in the area under crop cultivation and virtually static yields, government policy which favoured state farms and co-operatives created a lot of disincentives that contributed to the decline of agricultural production in the small-scale peasant sector.

Table 3. Two Years Average Estimated Amount and Percent Changes of Area, Yield, and Production of Major Crops for Selected Years (All in E.C).

Crop	Year	Area '000 ha.	Yield q/ha	Production '000 tons	% Change area	% Change production
	1958/59	2122.2	6.0	1276.3		
Teff	1965/66	1675.5	7.1	1189.5	-21.1	-6.8
	1975/76	1358.9	9.1	1231.0	-18.9	3.5
	1980/81	1290.7	8.1	1041.4	-5.0	-15.4
	1958/59	998.5	7.3	730.3		
Wheat	1965/66	811.0	8.0	648.8	-18.8	-11.2
	1975/76	669.8	11.8	791.4	-17.4	22.0
	1980/81	690.1	11.7	805.6	3.0	1.8
	1958/59	1662.7	8.4	1385.3		
Barley	1965/66	934.0	8.1	756.5	-43.8	-45.4
	1975/76	852.2	11.6	991.3	-8.8	31.0
	1980/81	869.4	11.4	994.3	2.0	0.3
	1958/59	1105.6	8.3	904.6		
Sorghum	1965/66	1006.0	8.7	870.2	-9.0	-3.8
	1975/76	909.7	14.1	1279.0	-9.6	47.0
	1980/81	823.2	11.9	978.2	-9.5	-23.5
	1958/59	816.2	10.1	819.4		
Maize	1965/66	876.5	10.1	885.2	7.4	8.0
	1975/76	820.3	19.1	1564.4	-6.4	76.7
	1980/81	985.0	17.9	1767.4	20.1	13.0
	1958/59	129.0	9.2	118.7		
Horse-	1965/66	137.5	8.6	117.6	6.6	-0.9
Beans	1975/76	365.5	13.5	494.8	165.8	20.7
	1980/81	260.0[a]	10.6	276.3	-28.9	44.2
	1958/59	129.1	9.2	118.7		
Field-	1965/66	150.7	4.9	73.9	16.7	-37.7
Peas	1975/76	137.1	9.8	126.2	-9.0	70.8
	1980/81[a]	106.1	7.9	83.5	-22.6	-33.8
	1958/59	279.0	6.2	173.0		
Chick-	1965/66	301.4	7.8	233.6	8.0	35.0
Peas	1975/76	153.8	7.6	113.5	-49.0	51.4
	1980/81[a]	95.3	7.6	72.2	-38.0	-36.4
	1958/59	371.3	6.2	230.2		
Neug	1965/66	151.0	4.0	59.7	-59.3	-74.1
	1975/76	163.7	4.2	68.9	8.4	15.4
	1980/81	128.6	3.5	44.7	-21.4	-35.1
	1958/59	112.0	5.0	56.0		
Linseed	1965/66	123.8	3.9	35.9	-31.9	-24.7
	1980/81	65.7	4.4	29.1	-22.1	-18.9

Source: Central Statistical Office of Ethiopia (ECSO), Various Statistical Abstracts.

a. Data was only available for 1980.

Between the years 1975/76 and 1985/86 peasant farms utilised, on average, about 95 percent of land farmed and produced over 96 percent of the national agricultural output. For the same period, state farms accounted for 3.2 percent of the total cultivated area and contributed about 2.8 percent of the national crop. The producers' co-operatives accounted for roughly 1.8 percent of land in agricultural use and contributed about 1.2 percent of the total national crop production (Belete, et.al, 1991). However, the lion's share of agricultural investments have been in state farms and co-operatives. For example, in 1983-84 the government invested 175 million birr in the state farms. By comparison, the government's 1984 ten year economic plan called for a total agricultural investment of 1.1 billion birr during 1984 (Ottaway, 1986). According to the ten-year development plan of Ethiopia (NRDC/CPSC) the peasant sector was to receive only 11 percent of the total investment planned for agriculture corresponding to two percent of the planned total national investment.

In addition to a meagre amount of investment allocation, the pattern of distribution of fertiliser, improved seed and agricultural credit has also disadvantaged smallholder farmers. For example, state farms in 1980/81 contributed less than five percent to national crop production and constituted less than five percent of the total area cultivated, but used 52 percent of the fertiliser, 79 percent of improved seed and 91 percent of agricultural credit available nationally. In the same year the peasant sector which cultivated 95 percent of the area and contributed 94 percent of the national harvest used 43, 16, and nine percent of fertiliser, improved seed and credit respectively which were available (Belete et.al, 1991).

AGRICULTURAL TRADE

Due to inadequate production and supply of food crops, Ethiopia was forced to become dependent on purchased grains and cereal preparations and foreign aid from other countries. For example, the Agricultural Marketing Corporation (AMC) has imported about 1.2 million quintals of grain annually, on the average, in the first half of the 1980s (Debela, 1989). Ethiopia's cereal and cereal preparations imports share from the total agriculture import trade increased to 60 percent in 1988 compared to 33 percent in 1974 when the revolution began. Also the burden of food import bill measured as a ratio of food imports to total export revenue increased. The ratios, in percentage, were 9, 19.5 and 71.8 for 1974, 1980 and 1988 respectively.

In terms of foreign trade, agricultural products balance of trade (export minus import) have also declined and recently showed a negative figure. Eighty five percent of Ethiopia's exports are agricultural. Until 1990 though the balance of trade showed a decline, the agricultural sector was able to cover its imports by its exports and remained with surplus. Gradually it lost this ability and by 1990 the government had to pay about 73 million dollars for agricultural imports either by borrowing or using surpluses from other sectors' balance of trade. The latter was not the case. Table 5 shows the whole economy's balance of trade has been negative for more than two decades.

The agriculture sector's share of total merchandise trade import in 1974 was about 13 percent. It increased to 28 percent by 1988. In a situation where the agricultural share of export trade is not changing significantly and positively, the highly significant change in the share of the agricultural imports again indicates that Ethiopia's economy is declining with a decline in agriculture.

CAUSES OF ECONOMIC DECLINE

In this section, the major causes of the decline of Ethiopia's agricultural economy are presented. War, government economic policy, natural disaster (drought and drought related epidemics) as well as political conflicts and national and international intrigues have been the major causes of Ethiopia's economic decline in the past two decades.

War

Given the history of Ethiopia, one can not confidently say that a specific decade was a decade of peace (Getachew, 1986; Getahun, 1990). In the past three decades, Ethiopians have been forced to fight big wars. The major ones were the Somalia aggression of the late 1970s and the long war with the secessionists in the Eritrea province. In addition to these, after the revolution, various political groups have pursued armed struggles in various parts of the country. These led to the destruction of several economic and social infrastructure.

The wars and conflicts created a diversion of economic resources particularly government expenditures from development to military activities. From 1974 till 1988, the government's budget for defence and internal security grew by about 122 percent. In the 1980s the military budget from the total government budget was about 50 percent (ECSO).

At the inception of the revolution the total number of soldiers in the various military institutions of Ethiopia were about 45,000. By 1987/88 this number increased to 300,000. Besides, in Eritrea the five groups, including the leading secessionist EPLF, have had more than 100,000 soldiers. TPLF has had 60-70 thousand soldiers. In general, these groups, the central government and others like OLF, in various fronts have had more than 600,000 soldiers and militia in the late 1980s (African events, 1991). Most of the soldiers that were either in the central government military institutions or in the various political groups were recruited from rural agricultural areas. They were drawn out from the economically active agricultural work force. This together with the bulging military budget lead to a decline in agriculture and the whole economy. Moreover, because of warfare, rural families have been destabilised. They were forced to migrate to neighbouring countries or within the nation, again affecting agriculture negatively.

Government Economic Policy

In Ethiopia, after the revolution, the government rode on a socialist economic policy with "Ethiopia Tikdem" philosophy. The policy embarked on various proclamations, including the confiscation of banks, financial institutions, insurance companies, large private factories and organisations as well as extra urban dwellings. It brought land under government ownership and distributed it to peasants.

The peasants in Ethiopia did not benefit from the piece of land they acquired via the land reform because of tremendous bottlenecks associated with the reform's implementation. In the words of Schwab, " in the first decade of the socialist era although much of Ethiopia's economic stagnation results from high oil prices, the world-wide recession and the decline in world prices for coffee, much of it is also due to the political turmoil caused by the radical and speedy land reform programme. The countryside was turned upside-down by the implementation of land reform and although it was politically necessary; it caused a certain amount of economic havoc " (Schwab, 1985, p.113). Because of the government's policy individual peasant farmers were forced to work in co-operatives. If small farmers chose not to be in co-operatives their access to farm inputs and credits were limited or curtailed (Ottaway, 1986). Moreover whether they were in co-operatives or not they were forced to sell their crops to AMC at a fixed low price. This amounted to killing production by disincentive.

In the move to establish AMC the government policy was to make farmers sell their crops to this corporation according to government set quotas and prices. Based on this policy the government's share of the total cereal, pulses and oilseed market via AMC and Ethiopian Oilseeds and Pulses Export Corporation reached 43 percent by 1987/88 (Debela, 1989). According to Debela, the government was purchasing 70 percent of oilseeds and pulses from private peasant farms at a price set by itself. Though the rest seems the private sector's share, in practice, through various regulations and bureaucratic exercises, the government was controlling the buying and selling of such commodities. The private grain merchants were forced to sell their end of year stock by AMC set price. Producers' co-operatives were selling their products totally to AMC at fixed prices.

By the establishment of AMC and the persuasion of a quota and controlled pricing policy both small farmers and consumers were hurt. For example, between 1988 and 1990 AMC was buying a quintal of teff at a fixed price of 42 birr (World Bank, 1990). During this time the urban consumer was buying a quintal of teff on average for about 200 birr (depending on the type and quality). In these years AMC was buying wheat, maize and sorghum at a fixed price of 33, 22, and 27 birr per quintal respectively from farmers while the urban consumer was buying (even from urban dwellers association distribution centres) by more than 100 birr per quintal. The big margin that had been created between the producer and consumer prices was mainly the result of inefficient and weak government agricultural policy. At the expense of the producer and urban consumer the government was running AMC with workers of high salary. By 1988 AMC's permanent employees were 860 at the headquarters and 2205 at branch offices.

Drought And Political Conflicts

In Ethiopia, drought, famine and epidemics are not exceptional occurrences in the past three decades (Getachew 1988, Pankhurst, 1972). However the droughts that occurred since the 1950s were extremely severe. Their severity was reflected even by the dryness of the rivers and lakes including Abbai (Blue Nile). In the mid 1980s, according to Ottaway (1986), Nile River, which receives 85 percent of its water from the Ethiopian plateau, was at its lowest level since 1913.

In general in the past three decades, drought, erratic rainfall and flood have been the major natural catastrophic incidents which contributed to the loss of millions of people, property and economic as well as social infrastructure. Rural areas were hit hardest by these problems. The damage caused by climatic and weather changes initially collapsed farming and then created an economic havoc in urban areas and the whole country. The drought and famine (partly natural and partly man made) were exacerbated by political conflicts which have had both internal and external roots.

When millions of Ethiopian's were suffering from the drought, famine and drought related epidemics, politicians both inside and outside Ethiopia as well as some international organisations and foreign governments used the situation to accomplish their political interests. Several political organisations of Ethiopian origin who were opposing the Mengistu administration requested foreign governments and organisations not to give food aid. Knowing that the major problem for food distribution was the lack of adequate transportation infrastructure in the rural areas, some political groups destroyed even the existing roads, bridges, etc., as a political strategy to weaken the Mengistu regime. In the late 1980s, in Ethiopia there were more than 15 different political groups (African Confidential, 1991; African Events, 1989 & 1991; African Research Bulletin: Political Series, 1991). That is why in the recent years the tremendous chaos and destruction observed in Ethiopia were also man made problems fuelled by different selfish and rampant political conflicts from within and without.

Many international organisations and foreign governments, some by co-operating with a specific political group, were reluctant (or completely feigned ignorance) to provide aid for the drought victims. Some foreign interest groups went out to sing in concerts and collect millions of dollars in the name of Ethiopia's drought victims but Ethiopia did not get even 10 percent of these collections (Dawit, 1989). Some remained quiet until their perceived appropriate time to attack the Mengistu regime. For this attack they used drought as a political instrument while millions of people were dying due to starvation. Some used their media and press networks to pledge but not make the pledges available on time or at all (The Economist, 1985; Anderson and Wilkinson, 1985).

Indeed there are elements where the Mengistu administration should be blamed both at policy and implementation levels regarding the drought and food aid issues. But that administration was not solely to blame. Many internal political groups and international organisations and foreign governments should also be blamed. As Magistad stated, many of the "facts" used as justification for condemning the Mengistu government and withholding aid have not been carefully enough analysed. Because of dubious information and allegations even the most urgent "humanitarian" aid to Ethiopia was halted during the most severe part of the crisis period.

SUMMARY AND CONCLUSIONS

During the socialist era, Ethiopia's economy was weakened. The economy declined with a decline in agriculture. The major factors contributing to this decline were war, inappropriate government policies, drought and political conflicts. These factors had both internal and external roots.

In Ethiopia unless the current transitional and the future permanent governments take the lesson and experience of the past two decades seriously, the fate of the nation is gloom.

The current transitional government of Ethiopia is following a new economic policy and political reforms. The practicality of these policies and reforms will be examined in future after the relevant data and information is established. However, the policies and reforms seem to have some weakness from the very beginning. The major weakness emerges from the fact that the transitional government is making some major and long term policy measures without including political groups which can have a tremendous impact on Ethiopia's future peace, economic and political stability and progress. It means that the policies and reforms are established on shaky social and political foundations.

It is time for any political group to realise that politics by force cannot govern Ethiopia. Ethiopians can be governed only by will, peace and an economy at least which can feed them.

In the short run to stop the decline of agriculture, government economic policy should be geared towards maintaining at least, the previous import share level of the agricultural sector. That is to cut the 28 percent, say, to 10 percent as it was at the beginning of the revolution. In particular the cereal imports must be reduced. The nation has both the potential and resources to be self-sufficient in grain production if appropriate policies and priorities are set.

Secondly, the country must come back to a positive balance of trade at least in the agricultural sector. This may help to make an improvement on Ethiopia's balance of payment problem in the short run. Moving to make an improvement in the whole economy's balance of trade problem in the short run will be a fatal exercise which will lead the country to more trouble and poverty.

Finally it is important to realise that the politics of food aid is a wide and complicated topic which cannot be addressed in a short paper. However, Ethiopians are not gullible and they understand the hidden motives of political organisations and foreign forces at any time. Certainly they will not be colonised in the name of food aid. Being subject to economic dependency is a matter of choice among devils. So long as things are not reaching the point of shaking the national unity and sovereignty there will always be some degree of compromise to economic dependency with known or unknown foreign intrigues and political conflicts whether emerging from within or without.

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SESSION 5: POSTGRADUATE TRAINING OF AGRICULTURAL ECONOMISTS

Chairman: A. Tiruneh

Rapporteur: F. Maimbo

5.1

TRAINING OF AGRICULTURAL ECONOMISTS AT SOKOINE UNIVERSITY OF AGRICULTURE, TANZANIA

M.E. Mlambiti[a]

INTRODUCTION

Since the establishment of the Department of Rural Economy in 1969 and approval of option syllabus in 1973 many changes have taken place within and outside the Faculty particularly the structure and content of the national agricultural education and the pattern of agricultural production. The heavy involvement of the state in the agricultural production activities coupled with greater emphasis on collective and consumal production modes and liberalisation of the economy had created a big demand for trained economists to man and/or advise the different institutions and entrepreneurs.

The total filled posts as of 1979 for all agricultural related organisations by staff of various specified educational levels was 5536 of which 7 percent is agricultural economists (USAID)[1], 1980). The commutative demand for the agricultural sector projected to 1991 is 25,408 (Exhibit IV, A)[a/] while the commutative supply projected for the same period is 10,812. These figures confirm the critical shortage of trained manpower supply not only for Agricultural Economists but for all agriculturists.

OBJECTIVES OF THIS PAPER

The main objective of this paper is to narrate briefly experiences and lessons gained in training and research in the field of agricultural economics and farm management. The specific objectives include giving some achievements attained in teaching and research in the past two decades; narrating problems encountered since the establishment of the program; and discussing future plans for improving the programme.

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1 For detailed analysis, See USAID: Tanzania Agricultural Sector Manpower Study: The Demand, Supply, Education and Utilisation of Professional and Technical Agricultural Personnel 1979 - 1986 Vol. I. Agency for International Development, Washington D.C. 1980.

ROLE OF AGRICULTURAL ECONOMISTS IN A NATIONAL ECONOMY

As expressed by Prof. Anthonio (1985) experience over the past two decades or so in Africa has highlighted the salient fact that in most African countries, what ought to be the role and responsibilities of agricultural economists is not fully defined hence not universally known or understood[4]. After all, the discipline did not gather sufficient momentum even in Europe until after the second World War. Because of this, the training curricula, and course content of agricultural economist had to be formulated to suit the objectives and demands of a given nation or zone which the university if expected to serve.

The major areas of responsibilities that can be easily identified as demanding the special services and expertise of agricultural economist include the following: (i) researchers in the economics of all aspects of agricultural production, marketing and processing and rural development; (ii) educationists and lecturers in the several disciplines of agricultural economics; (iii) management and policy advisors to governments, quasi-government institutions, parastatals and business enterprises in the related fields of agriculture and agro-allied industries and (iv) consultants in both the public and private sectors.

Within the public sector, demand for agricultural economists is most notable in related areas such as: agricultural extension agents, administration, research officers, lecturers in universities and other educational institutions of higher learning, management and executive officers in banking credit and finance institutions and legal adviser in resource use legislation. In the private sector, the agricultural economist can be (i) self employed as a farm managers, proprietor and consultant; (ii) officer in commercial agricultural farms, (iv) sales, management officer in enterprises dealing in agricultural chemicals and pharmaceutical establishments and (v) publishers/editors in journal magazines and newsprint.

THE TEACHING OF AGRICULTURE ECONOMISTS AT SOKOINE UNIVERSITY

Introduction

The teaching of agriculture economics courses at Sokoine University of Agriculture is done by the Department of Rural Economy which is considered as a service department for the undergraduate programme. The department of rural Economy was initially called the Department of Rural Economy and Extension until 1977. It was one of the original five departments of the then Faculty of agriculture established in 1969 as one of the faculties of the University of Dar es Salaam.

While formulating the agriculture economics courses for the University it was born in mind that a good agricultural economist needs a good background in agriculture for a thorough understanding of the forward and backward linkages in farm activities and for optimum resource utilisation, and that a useful exposure to all aspects of agricultural economics is

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4/ See Anthonio, Q.B.O. Training and Research for increased Agricultural Production in Africa - The Challenge of the Century (1985). Department of Agricultural Economics, University of Ibadan, Nigeria.

imperative to highlight in particular the inter dependency of all sectors of the farm business and farm household decision making unit. This is of particular importance to Tanzania where most of our farms - peasant as well as commercial are not specialised. Such a broad base knowledge in the subject helps the student to appreciate the implications of policies towards vertical and horizontal integration which is becoming more evident both as a means of diversification and soil fertility maintenance as well as for improving economies of scale for the small farmers.

Undergraduate Programme

Under the current programme, at the undergraduate level agricultural economics courses in Years I and II are taken by all students taking B.Sc. in Agriculture. In the final year, only those students who decided to take Rural Economy Option do take agriculture economics. Table 1 shows allocation of hours for agriculture economics courses taught to students taking B.Sc. degree in agriculture with a mild specialisation in agricultural economics in the final year. From this table it can be seen that in year I, agriculture economics courses form 20 percent of total hours covered by the student in the year while it is 18 percent and 66 percent for year II and III.

Table 1: SUA. Allocation of Hours for Agricultural Economics to RE Option in B.Sc. Programme.

	Year of Study				% of	% of
Program/Course	1	2	3	Total	Program	Ag. Coun
B.Sc. (Agric.) Program	518	591	410	1519	100	-
Introduction to Elementsof Econ	36	-	-	36	2.4	7.5
Introduction to PriceTheory	24	-	-	24	1.6	5.0
Agric. Development Policies	32	-	-	32	2.1	6.6
Agricultural Prices	12	-	-	12	0.8	2.5
Production Economics	-	23	-	23	1.5	4.8
Ag. Products marketing	-	28	-	28	1.8	5.8
Farm Management & Farm Planning	-	47	-	47	3.1	9.7
Table & Chart Construction and Data Coll.	-	10	-	10	0.6	2.1
Economic Theory	-	-	30	30	2.0	6.2
Agric. Prices and Trade	-	-	30	30	2.0	6.2
Agric. Marketing	-	-	30	30	2.0	6.2
Agric. Development	-	-	30	30	2.0	6.2
Economic Planning	-	-	30	30	2.0	6.2
Project Appraisal & Evaluation	-	-	30	30	2.0	6.2
Farm Management Econ.	-	-	30	30	2.0	6.2
Resource Economics	-	-	30	30	2.0	6.2
Applied Statistics & Econ. Analysis	-	-	30	30	2.0	6.2
Total (Agric.Econ.hrs)	104	108	270	482	31.9	100
% of Years total hours	20	18	66	-	-	-

The current programme is being phased out in favour for a four year degree programme aimed at producing graduates in agricultural economics. The programme is expected to start in 1969. In the first two years of the programme, students have to take all courses related with agriculture while in last two years they take only agricultural economics courses. This we hope will give the students a good background to become effective professionals in the field.

Table 2 shows the number of students who graduated under this programme pattern since the establishment of the department in 1969. From this table it can be noted that beginning in

1973/74, 25 third year students out of a class of 52 wrote special projects in the field of agriculture economics and a sizeable number continued to do so since then. The capacity of the department to take and handle more students has been the determining factor in deciding the number of student to join the option. The option is one of the most preferred options in the Faculty.

Table 2: Department of Rural Economy: Academic Staff, third year R.E. Option students and M.Sc. and Ph.D. candidates enrolled by Year 1969/70 to 1981/82 and 1982 to 1994

Year	Academic Staff[a]	3rd Year	M.Sc.(Ag. Econ)	Ph.D.(Ag. Econ)[c]
1969/70	4	0	0	
1970/71	7	0	0	
1971/72	3	0	0	
1972/73	7	0	0	
1973/74	8	25[b]	0	
1974/75	10	20[b]	5	1
1975/76	10	8[b]	4	
1976/77	7	19	7	
1977/78	7	-	4	
1978/79	8	7	3	
1979/80	12	7	-	1
1980/81	12	10	1	
1981/82	11	11	2	
1982	10	7	0	
1983	9	11	0	1
1984	9	10	0	
1985	2	17	1	
1986	15	17	0	
1987	16	16	3	
1988	16	14	0	
1989	18	12	7	
1990	19	18	8	
1991	20	22	-	1
1992	20	27	-	
1993	19	26	-	
1994	19	41	9	

a] Excludes tutorial assistants

b] Includes students doing special projects but had no specialised courses in agricultural economics as the case from 1976/77 onwards.

c] Ph.D. by research only.

Post Graduate Training Programme

The M.Sc. (Agric. Econ) programme began in 1974/75 with 5 candidates, all from Kenya. Yearly enrolment fluctuates as shown in Table 2 of the 54 M.Sc. (Agric. Econ) candidates shown, 42 had their theses accepted by Senate, three are being examined, and nine are to join in September. Overall one candidate failed and another dropped out. One Ph.D. has been accepted by Senate, another in the writing stage and a third passed away.

To improve post graduate training in agriculture Economics, in 1988 the department revised her post graduate curriculum. The review took into account new developments in the profession and in response to changing national and zonal manpower needs. The review has led to the introduction of a new option in the M.Sc. (Agric. Econ) with increased emphasis on quantitative agricultural and food policy analysis. Thus currently we have three options for the M.Sc. (Agric. Econ) Programme i.e. Farm Management, Marketing and Agricultural and Food Policy Analysis.

AGRICULTURAL ECONOMICS RESEARCH AND PUBLICATIONS

Research Activities

Most of the research projects that have been undertaken by the department are of applied type having in mind two objectives i.e. to be a source of data for planning and academic purposes and to be of immediate use by planners and entrepreneurs in the agricultural sector.

The problem of what research priorities should be is a complicated exercise. For Tanzania and most African countries, the galaxy of agricultural problems facing the people and government is rather horrendous. The heterogeneous array of geo-climatic situations complicates the problem and one cannot fail to appreciate the fact that international approach to research only gives the government an opportunity to assume that someone else is handling the problem he should have been concerned with initially. Another sad feature emerges that sometimes when the research findings are available they very rarely reach the ultimate users-the farmers. There is no doubt resource constraints and economic priorities of government being at variance with the priority of the farmers in a situation not improved by the presence of confusion between and among agricultural economists themselves.

Notwithstanding the above situation, the department since 1969 has carried out several research projects with the assistance of foreign donors. These are shown in Appendix I. In addition to research done by staff, we have research project carried out by students as pat of the programme requirements. Thus to date we have had about 345 special projects that have been undertaken by RE Option students and 42 M.Sc. and one Ph.D. research projects. All these are valuable sources of information and form an important data base.

Publications

In 1976 a series of rural Economy Research (RER) Papers was started. These were designed for world wide distribution and are sold at a price enough to cover reproduction and mailing costs. In 1977 a series of Rural Economy Technical (RET) Papers was started for use primarily within Tanzania. Both papers are still being published by the department but not in a regular manner due to time constraint. Most staff of the department publish their papers in international journals or as proceedings if delivered at conferences/workshop. Few special projects and M.Sc. papers have been edited and published as joint student-staff publications. The rest remain as single copies in the department and university library.

Books

A book "Introduction to Rural Economy for East African Students" has been published for one of the first year courses. A manuscript of a book "Planning Regional Agricultural Development Using LP: The Case of Kilimanjaro Region, Tanzania" has been submitted to Dar es Salaam University Press for consideration.

FACTOR AFFECTING THE TEACHING AND RESEARCH ACTIVITIES IN AGRICULTURAL ECONOMICS.

Introduction

Though it is very easy for outsiders and each members of the profession to be overly critical of the contribution of the department to the development process of Tanzania, it is of value to make such judgements against a framework or respective of the problems that the department faces in discharging its respective responsibilities and in positively responding to the urgent demands of the society in general.

It is not the purpose of this paper to exhaustively catalogue all the problems that inhibit the performance of the department of Rural Economy but to highlight a few main ones which have had great impact in the department's performance. These include the following:

Shortage of Staff

While the department rightly considers teaching and research as complementary functions, we are forced by understaffing to assign research to a back-seat position and devote all our efforts in teaching. It is only in the past four years or so that our staffing position has improved dramatically such that we can now afford to have a member of staff have a term off for research in a academic year. In as much as we recognise and fully ascribe to the inseparability of these functions, it must be realised that there are no soft options to their enactment: the linkage between teaching and research can only be satisfied if our department is optimally staffed. Because of this constraint, the rate of promotions for the department's staff has been very slow as movement up the ladder is pegged to the number of publications one can produce in a given period and not on the effectiveness as a teacher.

Inadequate Teaching and Research Facilities

The laboratory of agricultural economists is in the field as most of his/her research concerns people - their social life. Consequently availability of a reliable transport service is a precondition for a successful researcher as well as for having an effective teaching programme. Lack of transport and teaching facilities like seminar rooms have been the main limiting factor to the expansion of our RE option class.

Lack of Office block

Since the Department has no office block of its own, its staff are scattered in four different and distantly located office blocks making the administration of the Department very cumbersome and tiring particularly when the internal telephone system does not work. Most of our staff share offices with each other and some are even forced to share offices with staff members of other departments who are good Samaritans. We even find problems in getting space to accommodate a service like a computer unit which is used by the whole University. The situation is frustrating and disappointing.

Financial constraints

Financial constraint is another factor which vitiates the performance of the department. Insufficient budget allocations to the department has affected the department's capability to contribute meaningfully to teaching, research and dissemination of information. The budget allocated for the day to day activities of the department are so dismal that it is normally used up before the quarter is reached.

LESSONS LEARNT

The lessons learned have been derived from the department's research and teaching activities and not necessarily from the above discussion. Thus in order to facilitate the understanding of the main observations I have listed them according to certain key sectors/aspects.

National level

1. Given the predominance of agriculture in our economy, trained agricultural economists are as necessary as trained economic macro-planners in assisting our government to evolve a proper development strategy.

2. Ministry of agriculture and livestock Development has not been the most prestigious of government ministries. Judging by the share of public expenditure that is allocated to it, its significant role in guiding the economic destiny of the country seems hardly recognised.

3. Since our government has recognised the need for formulating food strategy as an integral part of the national development plan, there is need for having well-trained agricultural

economists who can work with other specialists in the public sector in order to evolve a national food policy along suitable line such as food consumption and nutritional aspects and food and agricultural policy analysis with the objective of warding off repeated famines and attainment of food self-sufficiency.

Public Agrarian Institutions

4. Most agrarian institutions though established to serve better the small farmer, have turned out to be a burden to the community in general and small farmer in particular making him poorer than before. thus our training should address to this situation.

Rural Sector

5. Public policy does not seem to pay much attention as it should to find out the actual impact of adopted policies to small scale peasant agriculture nor to the pivotal role of women in the rural economy, most of whom are poor and illiterate. The predominance of smallholdings and the crucial role of women as food growers and consumers are empirical realities which the government to be effective, must face up to. Agricultural economists in the public service should guide policy makers to appreciate the need to divert investment from big glamorous projects to millions of small cultivators who are the backbone of the economy. Consequently our students should be made aware of this problem.

Demand side

6. The demand for agricultural economists in Tanzania is greater than the supply. This situation will even be worse as the government increases its support for the existence and expansion of the private sector in the economy. Therefore much effort should be put on expanding our intake.

Supply side

7. The supply of agricultural economists depends greatly on the expansion and development of strong agricultural training programme at SUA which for the past twenty years or so prove to be an uphill task given the little administrative and other necessary support. Some financial support has to be sought to alleviate the problem.

Training institution

8. SUA should realise that agricultural economics is a very versatile field whose experts are needed to compliment and concretise the works of practically other experts in the economy. In cognisance of this fact SUA should take positive steps to ease the supply constraint of the agricultural economist which the nation is facing.

Future Plan

In the light of the experience gained in the past twenty five years as a training and research unit of SUA, the department's future plan aims at development of a national cadre of high-level human resources qualified in agricultural economics and rural development and capable of contributing effective specialist skills to the implementation of national policy in food and agricultural and livestock production by strengthening its programme at both the undergraduate as well as the post graduate levels.

At the undergraduate level, the department plans to establish a four year degree programme in Agricultural economics to enable the graduate get a strong base of economic theory, mathematics and modern tools of analysis to make them effective managers and planners. Given a strong undergraduate foundation the department anticipated to introduce a one year M.Sc. degree in the long run.

At the M.Sc. level, the department intends to maintain a flexible post-graduate programme that allows establishment of programmes according to clients demand as dictated by developmental process. The issue of developing short courses for different groups and levels of participants will be given a close attention and will be effected once there is a confirmed demand for the service.

For in service staff, the Department has planned to establish a short course programme in micro-computer applications. The objective of the programme is to develop and run agricultural economics short courses aimed at enhancing and bettering professional capabilities in solving developmental problems of the country.

CONCLUSION

This paper attempts to show that given the nation's economic set up, agricultural economists have a significant role to play and that the demand for agricultural economists exceeds the supply which is constrained by factors such as lack of qualified staff, finance and good and enough teaching and research facilities.

There is no doubt that involvement of agricultural economists in planning and decision making processes that are related to national development is a positive step towards alleviating our economic crisis and that deliberate effort be made to effect this. However, this does not necessarily mean that agricultural economists have answers to our problems but it only emphases the fact that development process is a struggle which demands a balanced recognition of the importance of every factor of production in the process of planning for economic development.

APPENDIX 1:LIST OF RESEARCH PROJECTS INVOLVING OUTSIDE DONORS CARRIED OUT BY THE DEPARTMENT SINCE 1969.

1. A study of Ujamaa villages in Iringa for the Iringa regional Planning team.
2. Feasibility study on fruits and vegetable canning for the Tanzania investment bank.
3. Economics of traditional storage of grains in Tanzania financed by Ford Foundation and published in Tropical stored products, 30, 1975.
4. Economics of intercropping in Morogoro district part of a joint project with the crop science department financed by CIDA.
5. An assessment of the National Maize project in Morogoro region funded by USAID.
6. Problems and prospects for development of agro-industries in Tanzania for the Japanese external trade organisation.
7. Feasibility study for Soybean production in Morogoro district for UNICEF.
8. In Co-operation with CIMMYT a study on farming systems in Morogoro district and Kilosa districts (A report issued in 1977 by CIMMYT Nairobi office).
9. In co-operation with Crop Science department on a study of farming systems in Morogoro district funded by IDRC.
10. A survey of 5 agricultural research Institutes in Tanzania with emphasis on ways to improve management of the research system, a joint project with IDM funded by Ford Foundation (summarised in RER paper 7).
11. Identification of constraints to the establishment of small-scale village projects, a faculty-wide project co-ordinated by the agricultural education and extension department and Food foundation.
12. Production and marketing of oil seeds in Morogoro region funded by IDRC.
13. Co-operation with Animal Science department on small farmer dairy feeding system (IDRC).
14. Co-operation with Crop Science department on Bean-cowpea research funded by USAID.
15. Co-operation with Department of Agricultural education and Extension and Kilombero Agricultural Training and Research Institute of Ifakara on Rural development planning in Ulanga District Funded by IDRC. Many small research projects financed by SUA have been carried out and results are available from-within the department.
16. Sorghum and Millet Marketing and Utilisation for Food Security and Development in Tanzania (IDRC)
17. Agricultural Diversification and Intensification Study in Tanzania (World Bank).

5.2

POSTGRADUATE TRAINING, UGANDA

T. Hyuha[a]

IMMEDIATE POST INDEPENDENCE ERA UP TO 1980

1.1 The information available puts the start of this program around 1968. In that year nine postgraduate students registered in the department. The department then served all the Eastern and Southern African countries. The main objective of this program was to train the manpower who would handle policy issues in Agricultural Development.

1.2 The program was sponsored by the Ford Foundation.

1.3 According to the annual Report by the head of department then, this program succeeded in eliciting interest of the nationals particularly those taking BA Rural Economy into pursuing further studies in Agricultural Economics. This also assisted the efforts in localisation of the departmental staff where seven Ugandans were appointed at a rank of Research Assistants in the department.

1.4 The seven Ugandans were then sent for further training abroad, particularly to USA and Britain. Prof. Bingambah, Dr. Opio Odongo and Dr. Msemakweli.

MSc PROGRAM (SINCE 1980)

2.1 The M.Sc. program which started in 1968 remained active up to about 1974/75 academic year when the donor agencies pulled out due to the insecurity which was prevailing in the country then. The program remained dormant throughout the rest of the period 1970's and 1980's. It was only resuscitated in 1991/92 academic year through the USAID funding under the project entitled manpower for Agricultural Development (FAD).

The main objective still remained as that of providing a highly trained as that of providing a highly trained and specialised manpower needed for deployment in agricultural research systems, policy making bodies and departments of high institutions of learning which offer courses in agricultural economics.

2.2 Although the objective has remained more or less the same the emphasis has changed. The earlier program emphasised research component whereas the present one emphasises course work. It has been felt that this is necessary to provide a theoretical background to students in preparation for carrying out research activities in areas of interest.

The two programs also differ in period of coverage, whereas in the earlier period, the program covered 12 months where a student was required to produce two or more written

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papers, the present one, takes 18 months. The course work is done in the first 12 months, while the last six months are devoted to research activities and thesis write up.

The core courses covered in this programme are:-

RE 501 Advanced Microeconomics
RE 502 Advanced Macroeconomics
RE 503 Applied Agricultural Production Economics
RE 504 Advanced Farm Management and Agribusiness
RE 505 International Agricultural Trade
RE 506 Econometrics I(Quantitative Methods)
RE 507 Rural Development Resource Economics
RE 508 Econometrics II

Elective Courses are:-

RE 509 Advanced Agricultural marketing
RE 510 Selected Topics in Agricultural Development and Farm Management
RE 511 Investment Project analysis, Policy and Implementation

2.3 Since resuscitation, enrolment rate in 1991/92 was 20, it was 17 in 1992/93 and 14 in 1993/94. The 1991/92 intake has graduated while the 1992/93 have finished their coursework and are now busy preparing for field work for the research projects. The 1993/94 intake are in the 2nd term of their course work.

LINKAGES

3.1 The department mainly co-operates with two departments in the University, i.e. Department of Economics and Institute of Statistics and Applied Economics. The students take 4 courses (Advanced Microeconomics, Advanced Macroeconomics and Econometrics I and II) in the former and computer skills in the latter.

3.2 As far as supervision and examining of the MSc Theses, the department has relied more on qualified individuals within the system (country). So far they have proved to be a useful resource.

SOURCES OF FUNDING FOR THE PROGRAMME

The main source of funding has basically been donor agencies. The two intakes of 1991/92 and 1992/93 were basically funded by USAID and Rockefeller, respectively. The 1993/94 has partially been funded by the Government of Uganda and USAID. This funding as not been consistent and sustainable and therefore has greatly affected the smooth running of the programs. For instance, the 3rd intake has to start 1 semester late, the funds promised by god father did not materialise and we did not learn of it until it was too late.

DEMAND AND SUPPLY OF AGRICULTURAL ECONOMISTS

As the national economy continues to pick up from the crisis of the 1970's and 1980's the demand for agricultural economists has strongly picked up. The various institutions and organisations demanding qualified agricultural economists are:-

1) The newly set up National Agricultural Research Organisation (NARO) which will require a critical mass of research oriented agricultural economists needed to main its socio-economic unit. Besides, researchers will be needed in every other research program to handle the socio-economic aspects.

2) The Ministry of Agriculture Animal Resources and Fisheries as a whole needs economists for policy analysis and planning of development programmes.

3) Bank of Uganda (agricultural Secretariat) and Uganda Co-operative Alliance need Agricultural Economists.

4) NGO's and private sector which has been expanding will need a sizeable number of qualified agricultural economists as farm managers, marketing specialists consultants and advisors in their programs.

As the list shows the choice is wide, and at present our department is not able to cope with this increased demand. This situation can be gauged from the ease with which our graduates are being absorbed after graduation and the popularity of the program - within the faculty. However, as mentioned earlier the program is greatly underfunded and suffers from lack of qualified manpower on the ground.

CONCLUDING REMARKS

The country is catering adequately for the country's demand for agricultural economists. The funding has generally been from donor agencies and whenever they pulled out the program collapsed. The program therefore has remained unsustainable and its performance has depended on the mood of the donor agencies.

Although the government recognises that it needs agricultural economists to main many of its programmes, this recognition has not been followed by appropriate investment. It is therefore a high time that the government increased investment in training the agricultural economists to play their useful role.

From our own experience, training agricultural economists locally is cost effective than sending them abroad. The same amount one PH.D. candidate abroad can easily 7 MSc students at domestically.

5.3

THE DEMAND FOR AND THE SUPPLY OF THE TRAINING OF AGRICULTURAL ECONOMISTS IN KENYA: PROSPECTS AND CONSTRAINTS

Stephen G. Mbogoh[a]

BACKGROUND

There are a number of both private and public universities in Kenya which could, in principle, mount training programmes to produce agricultural economists. However, none of the private universities in Kenya offers such a programme. Of the five public universities in Kenya, viz.: The University of Nairobi, The Moi University, The Kenyatta University, The Egerton University and The Jomo Kenyatta University of Agriculture and Technology, only the University of Nairobi and The Egerton University currently offer some training programmes to produce agricultural economists. The Moi University plans to mount a training programme to produce agricultural economists during the 1994/95 academic year. This paper examines the status of the University of Nairobi and The Egerton University as producers of agricultural economists and The Moi University as a future producer of agricultural economists in relation to their training programmes.

Since The Egerton University is relatively new as a training institution for agricultural economists while The Moi University plans to mount a training programme during the 1994/95 academic year, the bulk of this paper is devoted to the analysis of the training programme at The University of Nairobi which has been mounting a programme to produce agricultural economists since the early 1970s.

TRAINING PROGRAMMES TO PRODUCE AGRICULTURAL ECONOMISTS IN KENYAN UNIVERSITIES OTHER THAN THE UNIVERSITY OF NAIROBI

The Situation at The Egerton University

The Egerton University originates from the Egerton Agricultural College which was founded in 1939 to train European settlers on how to conduct profitable farming in Kenya during the colonial days. After Kenya acquired her political independence in 1963, The Egerton College continued to serve as an agricultural training centre for diplomates on modern farming methods up to the time the college was elevated to a university status in 1986. The College used to offer a Diploma in Farm Management before it embarked on programmes to offer degrees after elevation to a University status in 1986. Hence the role of the Egerton College, one can argue, was to produce para-professionals in agricultural economics.

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After elevation to a university status, The Egerton University mounted its first degree programme during the 1986/87 academic year -- the relevant programme being the B.Sc. (Agricultural Economics) programme. Of course the institution still continued offering the Diploma in Farm Management Programme even after elevation to a university status. One should view the B.Sc. (Agricultural Economics) programme as producing semi-professionals in agricultural economics who need further training at Master's (M.Sc. or MA) level to convert them into professional agricultural economists.

The Egerton University mounted its first postgraduate (M.Sc.) programme to produce agricultural economists during the 1991/92 academic year, with 6 (six) registered students. Those students are expected to graduate any time this year (1994). The second intake of the M.Sc. (Agricultural Economics) students at The Egerton University will take place late in 1994, the planned number of students intake being eight. Both the B.Sc. and M.Sc. programmes in Agricultural Economics at Egerton University are offered by the Department of Agricultural Economics and Agribusiness Management at the said institution.

The M.Sc. (Agricultural Economics) programme at the Egerton University builds upon the B.Sc. (Agricultural Economics) Programme at the same institution, and is based on Coursework and Research-based Thesis. Expected duration of the programme is two (2) years, but it is expected that average students may take up to three (3) years to complete the programme. The first year of the programme involves coursework, while the second year of the programme involves research and thesis preparation and submission for evaluation. The coursework covers a core programme in Economic Theory (Both Micro and Macro Economics), Quantitative Methods (Statistics, Mathematics and Econometrics) and Applications (Production Economics, Farm Management, Agricultural Marketing and Options in Mathematical Programming, Agricultural Price Analysis, Agricultural Policy Analysis, Agricultural Finance and International Agricultural Trade). Courses in the B.Sc. (Agricultural Economics) programme are regarded as prerequisites for the courses in the M.Sc. (Agricultural Economics) programme.

Situation at The Moi University

The Moi University was the second Public University to be established in Kenya: it became operational during the 1982/83 academic year. The planned training programme to produce agricultural economists at The Moi University will be offered by the Department of Marketing and Co-operatives within the Faculty of Agriculture. The Faculty is concentrating only on postgraduate training, leading to a Master of Philosophy (M.Phil.) degree in the relevant training fields. The Department of Marketing and Co-operatives at The Moi University plans to initially offer an M.Phil. degree programme in Agricultural Marketing and Co-operatives Options, beginning September 1994 (for the 1994/95 Academic year), but other options (e.g. Resource Economics and Agricultural Policy) are planned to be introduced in the near future.

TRAINING OF AGRICULTURAL ECONOMISTS AT THE UNIVERSITY OF NAIROBI IN KENYA

Background

The training of agricultural economists at the University of Nairobi is undertaken by the Department of Agricultural Economics within the said institution. The Department of Agricultural Economics is one of the constituent Departments of the Faculty of Agriculture, University of Nairobi.

The other Faculty Departments are the:

- Department of Crop Science.
- Department of Food Technology & Nutrition.
- Department of Soil Science.
- Department of Range Management.
- Department of Animal Production.
- Department of Agricultural Engineering.

The Faculty offers the following Bachelor's degree programmes:

- B.Sc. (Agriculture)
- B.Sc. (Food Science & Technology)
- B.Sc.(Range Management)
- B.Sc. (Agricultural Engineering)

The different Departments also offer higher degree programmes (Master's and Doctoral degrees) in their fields of specialisation.

The development of the Faculty of Agriculture, and hence that of the Department of Agricultural Economics, dates back to July 1970 when the University of Nairobi was established as an autonomous institution: before then, it was a constituent college of the University of East Africa.

As is evident from the preceding paragraph, the Department of Agricultural Economics does not offer an undergraduate degree programme, but it services all the other undergraduate degree programmes in the Faculty. However, the Department does offer, and has offered since the 1970s, a Master's degree programme, which is the main subject of our discussion as far as the training of agricultural economists at the University of Nairobi is concerned. Prior to July 1973, the Master's degree training at the Department was based on research and thesis only. Since August 1973, the Master's degree programmes offered at the Department have been based on Coursework, Research and Thesis. The Department can offer a Doctoral degree (Ph.D.) programme based on research and thesis and has recently had a few doctoral (Ph.D.) students registered (two at present). However, the Department has not produced a doctoral (Ph.D.) graduate so far. The Department of Agricultural Economics at The University of Nairobi has been and continues to be the major centre in Kenya for the training of agricultural economists.

The details of the Master's degree programmes offered by the Department since 1970, in terms of the type of M.Sc. programme, the period, the total number of registered students, those successful in Part I examination (passing (Coursework Examination), those passing Part II examination (Theses Accepted), and those failing (discontinued) are given in Table l.

DEMAND FOR AND SUPPLY OF TRAINING IN AGRICULTURAL ECONOMICS AT THE UNIVERSITY OF NAIROBI

Hitherto, the Department of Agricultural Economics at the University of Nairobi has basically functioned as a service facility at Bachelor's degree (undergraduate) training programmes since none of the Bachelor's degrees programmes have offered specialisation in Agricultural Economics. However, all undergraduate degree programmes offered in the Faculty of Agriculture include some courses in the field of agricultural economics. Hence one could argue that the exposure of such undergraduate students to basic courses in agricultural economics is the beginning of the training of professionals in agricultural economics because, upon graduation, the same people become the main applicants for postgraduate training in agricultural economics.

With curricular changes and the adoption of the so-called 8-4-4 education system in Kenya, the Department is now ready to offer an agricultural economics specialisation option to B.Sc. (Agriculture) students in their final (4th) year of this under programme.

Supply Side

The Department of Agricultural Economics at the University of Nairobi is committed to excellence in teaching, research and outreach. The Department plans to continue giving its best in the training of professionals in the various sub-disciplines in the field of agricultural economics, both at undergraduate and postgraduate levels. Professional training emphasis in the future shall be on B.Sc. students who take Agricultural Economics Option, and M.Sc. (Agricultural Economics) and Ph.D. (Agricultural Economics) students. The Department will continue to encourage and give support to staff in their research efforts, including the presentation of research proposals to potential sponsors. The Department plans to have the research findings from the work undertaken by its staff members and students disseminated to interested parties through its outreach activities and publications in relevant journals and newsletters.

In order to achieve its objectives, the Department intends to review, restructure and strengthen its academic programmes and research work through internal reorganisation and establishment of specialised units within the Department. The plan is to have each unit headed by a staff member in the rank of at least an Associate Professor. The proposed specialised units within the Department are:

- Farm Management, Production and Resource Economics Unit.
- Agricultural Marketing, International Trade and Agribusiness Management Unit.
- Development Economics, Agricultural Extension and Agricultural Policy Unit.
- Economic Theory and Quantitative Methods Unit.

The proposed specialised units within the Department give the basis for future staffing and physical facility and equipment requirements. A strong Technical Support Services Unit will also be needed in order to effectively service the specialised units.

EXISTING PROGRAMMES

B.Sc. Programme

The Department offers courses in Economic Theory, Farm Management, Agricultural Marketing, Agricultural Policy, Agricultural Extension, Rural Development, Resource Economics and Farm Accounts and Planning to B.Sc. Agriculture and Range Management students. The Department also offers service courses to students in the Departments of Agricultural Engineering and Food Science and the Faculties of Veterinary Medicine, Science and Architecture. With the Faculty of Agriculture's change of Policy to offer options in its B.Sc. programme under the 8-4-4 scheme, the Department will have its first batch of students in 1994 who will specialise in Agricultural Economics in the fourth year.

M.Sc. Programme

The M.Sc. (Agricultural Economics) programme course offers nine 40-hour compulsory courses in first, second and third terms and four options in the fourth term. The options are Agricultural Marketing, Farm Management, Food Economics and Management and Development Economics.

The Department intends, within the next six years, to revise the programme with a view to improving the contents of the various courses and/or adding new courses to the compulsory (core) and optional components.

The Departments also services the MA(Planning) programme in the Department of Urban & Regional Planning by offering a course in Agricultural Planning.

The Department has trained agricultural economists from different countries in Eastern & Southern Africa over the years. It has also had some students from the developed world. Table 1 gives the developments in the registration and training of agricultural economists while Table 7 gives a summary of the number of registered M.Sc. (Agricultural Economics) students by nationality since 1970.

Table l: M.Sc. Registration Department of Agricultural Economics, University of Nairobi, 1970 - 1993.

M.Sc. Course	Period	Total Reg.	Successful in A	B	C	D
M.Sc. by Theses	July 1970-July 1973	5	-	3	-	2
Extension	Aug. 1973-July 1975	4	4	-	1	
Marketing	May 1974-May 1976	16	16	14	-	2
Marketing II	Oct. 1976-Sept. 1978	10	9	8	-	-
Marketing III	Oct. 1976-Oct. 1978	7	5	5	-	2
Agric. Econ.	Oct. 1977-Oct. 1979	18	16	13	-	5
Agric. Econ.	Oct. 1978-Oct. 1980	14	14	6	-	7
" "	" 1980 " 1982	5	4	3	-	2
" "	" 1983 " 1985	8	8	6	-	2
" "	" 1985 " 1987	14	13	9	-	3
" "	" 1987 " 1989	18	18	17	-	1
" "	" 1989 " 1991	20	20	13	7	-
" "	" 1991 " 1993	12	11	-	11	-
" "	" 1993 " 1995	5	-	-	5	-
Total		157	138	101	23	24

Source: Departmental files

Note: A. Part I Exam, B. Thesis acceptance C. Theses pending D. Discontinued

Table 2: Distribution of Registered M.Sc. students by Nationality (1970 - 1993)

Nationality	No
Kenyan	120
Ugandan	22
Tanzania	6
Ethiopia	4
British	2
Zambian	2
Swazi	1
Total	157

For the total number of registered students, success rate may be taken to be about 75% on the minimum. Hence the Department has produced over 125 agricultural economists since its inception in July 1970.

PROPOSED B.Sc. CURRICULAR CHANGES

The Faculty of Agriculture is already implementing the 8-4-4 B.Sc. programme with options in the fourth year. With the experience of three years since the Faculty started implementing the 8-4-4 programme, the Department has decided to revise its B.Sc. courses as follows:

Schedule: Proposed Agricultural Economics Courses for Undergraduate Programmes.

BCUS = Board of Common Undergraduate Studies

YEAR		
I		BCUC Courses (Fundamentals of Development and Elements of Economics)
II	S1	Introduction to Agricultural Economics (A/R/F/AE)
	S2	Principles of Farm Management & Resource Use(A/R/F/AE)
III	S1	Farm Accounts and Planning (A/R/F/AE)
		Basic Concepts of Marketing (A/R/F)
		Macroeconomics (A/R/F)
	S2	Development Economics (A/R)
		Agricultural Law (A/R)
		Rural Sociology and Extension (A/R/AE)
IV	S1	Agricultural Policy Analysis
		Quantitative Methods in Agric Economics
		Research Methods and Introduction to Computers
		Agricultural Marketing, Agribusiness Management and International Trade
	S2	Intermediate Economic Theory
		Resource Economics
		Project Planning and Evaluation
		Special Report

LEGEND:

S1 = Semester 1	S2 = Semester 2
A = B.Sc. (Agriculture) students	R = B.Sc. (Range Management) "
F = B.Sc. (Food Science) "	AE = B.Sc. (Agricultural Engineering) "

OUTREACH

For the immediate future, The Department plans to conduct in-service training for graduates employed in the civil and parastatal sectors. The training programmes could be expanded to cover neighbouring countries whenever funds allow. Anticipated are short-term certificate courses on topics such as statistics, data collection/analysis for socio-economic topics, farm management, applied econometrics, research methodology, agricultural extension and project planning and evaluation. This aspect can be designed in such a way that it is income-generating in order to facilitate continuity. Whether or not this plan gets implemented will depend on availability of funds as well as staff to act as instructors. We urge donors to view these proposals favourably.

ACADEMIC STAFF LEVELS AND ESTABLISHMENT

Academic Staff

Currently (1994), there are 23 established positions, but only 8 are occupied by Ph.D. holders. Eight lecturer posts are held by M.Sc. holders, ultimately aimed for further (doctoral)

training under staff development. There are thus some vacant positions as follows: Professor 1; Senior Lecturer 2; and Lecturers 4 (Table 3).

The implication of the above situation is that Ph.D. training, either locally or abroad, is a major priority for the Department. In view of the continued contingency of staff resignations and the inevitable attrition of any academic department for which its staff are in national and international demand, there needs to be, at a minimum, a new Ph.D. graduate student on staff development on line every 2 years. This means that there should be at least 2 staff development Ph.D. trainees at any given moment, assuming a four-year training programme.

The issues of departmental stability, continuity of teaching services and ability of staff to conduct academic research and consultancies make it imperative that the minimum staff number based on FTSE (Full Time Staff Equivalent) must be sustained at all times. It is also important that the lecturer status is not heavily weighted in favour of M.Sc. holders on staff development, important as the latter category may be for ensuring a readily available trainable staff development stock. To meet the above demand, it follows that an addition of preferably seven Lecturers who are Ph.D. holders have to be recruited by 1996/97 when the Department plans to start a Ph.D. training programme. The anticipated staff establishment should be as follows: Professors, 2; Assoc. Professors, 4; Senior Lecturers, 8 and Lecturers, 16 to make a total of 30.

The Department foresee no problems with offering the needed services to undergraduate programmes if the plans outlined above can be implemented, namely, that the Academic Staff force is sustained at between 25 and 30 within the next six years and that at least two M.Sc. holder members of staff are sent for doctoral training every year.

The question of staff resignations, although relevant, is difficult to anticipate and pin down to realistic numbers for planning purposes.

Tables 3 and 4 give a summary of the actual and projected staffing and training needs at the Department up to year 2000.

Table 3: Academic Staff levels and establishment (1994)

Serial No.	Designation	Approved Establishment	In post	Shortfall
1	Professor	1	0	1
2	Associate Professor	2	2	0
3	Senior Lecturer	5	3	2
4	Lecturer	15	11	4
	TOTAL	23	16	7

TABLE 4: 1993/94, Projected Staffing, Facilities Requirements and Training Needs to Year 2000

Undergraduate Programmes	94/95	95/96	96/97	97/98	98/99	1999/2000
_**Staff Needs** (PhD+MSc)	23	25	28	30	30	30
Teaching Assistants						
(BSc + MSc)	2	4	5	5	5	5
Postgraduate Programmes						
Student Number MSc	5	5	25	25	25	
Student Number PhD	-	-	-	8	8	
Staff Needs (PhD only)	8	15	15	20	20	
Computers (PCs)	8	13	13	15	15	
Xerox Machine	1	2	2	2	2	
Duplicating Machine	0	1	1	1	1	
Typewriters	1	5	5	5	5	
Overhead Projectors	1	4	4	4	4	
Printers (1 laser jet)	2	5	5	5	5	
Electronic Stencil						
Scanner	0	1	1	1	1	
Other equipment						
Vehicles 4(old) 4(2 new)	4	4	4	4	4	4
Office space						
Office	9	9	30	30	35	
Lecturer Hall(Capacity 100)	-	1	1	1	1	1
Seminar Room (Capacity 50)	-	1	1	1	1	1
Department Office (new)	-	1	1	1	1	1
Computer Lab	-	1	1	1	1	1
Machine/Equipment Room	-	1	1	1	1	1
Department Library	-	1	1	1	1	1
Staff Common Room	-	1	1	1	1	1
Graduate Students						
Facilities	-	4	4	4	4	4
Support Staff						
Secretaries	2	3	3	5	5	5
Principal Technologist	1	1	1	1	1	1
Chief Technologist	1	1	1	1	1	1
Senior Technologist	1	2	2	2	2	2
Technologists	2	2	2	2	2	2
Computer Programmers	1	1	1	1	1	1
Enumerators	2	4	4	4	4	4
Drivers	1	2	2	2	2	2
Computing Assistant	-	1	1	1	1	1

Support Staff

Currently there are the following support staff categories:

2 Secretaries
1 Graduate Research Assistant
1 Technician
1 Computer Programmer
1 Enumerator
1 Driver

In the next six years, there will be a need for increasing the figures for all the categories and also for making funds available for at least three Research/Teaching Assistants. One of the programmers will need to be properly trained in computer science and technology in order to be able to assist graduate students (expected to be numbering 20 - 25). The current support staff levels and projections for the next six years are summarised in Table 2.

DEMAND SIDE

Table 1 gives an overview of the demand side as far as the graduate (professional) training in agricultural economics at the Department of Agricultural Economics at the University of Nairobi is concerned. Obviously, not every applicant gets admitted, so that Table 1 understates the demand side. I am confident that I would not be wrong in stating that the M.Sc. (Agricultural Economics) programme has remained the most popular (and hence competitive) graduate programme at the Faculty. The Department has not been able to admit more than 50% of the applicants at any one year due to resource limitations. Table 2 gives a breakdown of the M.Sc. students intake and training at the Department since 1970.

Table 1 indicates a fluctuation in the number of registered students from year to year, but this is occasioned largely by the need to keep the numbers within what the staff can cope with and the lack of scholarships rather than by demand. For example, the Department enrolled 18 students in 1987 compared to 14 in 1985. The large intake in 1987 created considerable stress among the Department's members of staff who are capable of graduate supervision. In 1991, the number dropped to 12 and further down to 5 in 1993. This downward trend, although in line with staffing and facility limitations, has been occasioned largely by the lack of scholarships rather than by demand for training at the M.Sc. level.

The demand for training at undergraduate level is largely occasioned by the general development in the Faculty undergraduate programmes. The number of undergraduate students enrolling for undergraduate (Bachelor's degrees) programmes in the Faculty has steadily increased from 41 in 1970 to about 300 during the "double-intake" period (1987/88 - 1990/91 academic programme) and then down to an average of about 180 annually. These numbers reflect the heavy demand that the undergraduate programmes impose on Departmental staff time and resources. Hence it will be necessary to rationalise the resources that are made available to facilitate the training of agricultural economists by the Department in future.

CONCLUDING REMARKS

Well trained agricultural economists are in high demand in Kenya. This is evident from the absorption of those who have successfully completed their M.Sc. programmes since the 1970s. Many of such graduates have joined Universities as faculty staff. Others are in the civil service. Quite a number are in the Private Sector. Demand for those with biological (agriculture) training at undergraduate training is particularly good.

The future of agricultural economists in terms of job prospects is still good. We should thus consolidate our training programmes and produce agricultural economists who can meet the professional challenges of tomorrow.

5.4

POSTGRADUATE TRAINING IN AGRICULTURAL ECONOMICS IN MALAWI

D. H. Ng'ong'ola[a]

INTRODUCTION

Malawi's broad policy objective for the education sector is to develop an efficient and high quality system of education of the type and size appropriate both to available resources and to the political, social and economic aspirations of the nation. The formal education system is a conventional primary, secondary and tertiary structure [Malawi Government, Office of the President and Cabinet (OPC), 1987].

The University of Malawi was established in 1965 and comprises five constituent colleges: Bunda College of Agriculture; Chancellor College; Kamuzu College of Nursing; The Polytechnic; and the College of Medicine. The University's Faculty of Agriculture is located at Bunda College of Agriculture. Bunda College is a multi-disciplinary single faculty officially established in 1967. From its inception, the college was designed to provide agricultural training to the Diploma level mainly for the extension service. However, over the years, the objective of the college has changed to encompass, not only the production of extension officers, but also farm managers, teachers of agriculture, research assistants and technicians, both in government and private sectors.

Bunda College has five academic departments; Agricultural Engineering, Animal Science, Crop Science, Home Economics/Human Nutrition and Rural Development Departments. The college mounts an end-on Diploma/Degree Programme leading to a Diploma in Agriculture after three years and a Degree in Agriculture in five years. The college also mounts postgraduate programmes leading to either MSc or PhD degrees. Currently, Bunda College offers full-time and part-time MSc Programmes in Agricultural Economics, Agronomy and Animal Science. Stipulated period for a full-time MSc programme is two years with a minimum period of one year, whereas that for the part-time programme is four years (University of Malawi, 1989)

POSTGRADUATE TRAINING IN AGRICULTURAL ECONOMICS

The objective of the MSc Agricultural Economics Programme is to produce postgraduates conversant with economic principles applied in solving economic problems of the agricultural sector and capable of conducting research dealing with problems of practical importance. Agriculture is the mainstay of Malawi's economy accounting for the highest contribution to the gross domestic product, foreign exchange earnings and employment (Malawi Government, OPC, 1994).

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Postgraduate training in agricultural economics in the University of Malawi started at the Masters level in 1988, when one full-time candidate registered under the sponsorship of IDRC through a Beef/Dairy Project. However, due to delays in revising the University statutes, candidates could only register as MSc students in Agriculture until 1992/93, although they were infact studying agricultural economics. Due to lack of students' sponsorship, the full-time MSc programme could not be mounted between 1989/90 and 1991/92; only three candidates registered as part-time candidates during the period under the sponsorship of the Rockefeller Foundation, the International Centre for Living Aquatic Resources Management (ICLARM) and the Bean/Cowpea Project (Table 1).

Table 1: Number of MSc Agricultural Economics candidates by programme type and academic year[a]

type	1987/ 88	1988/ 89	1989/ 90	1990/ 91	1991/ 92	1992/ 93	1993/ 94
Full-time	1	1	-	-	-	3	6
Part-time	-	-	2	2	3	3	3
Total	1	1	2	2	3	6	9

a. Academic year normally starts in September and ends in July although teaching starts normally starts in October and ends in June.

Beginning January 1993, BCA started mounting a full-time MSc in Agricultural Economics Programme with a revised curriculum and syllabi. The revised programme contains more courses (number of courses has doubled) and puts more focus on food, agricultural and nutrition policy. Emphasis on policy was considered important due to the complex agricultural policy issues that Malawi faces and the lack of expertise to properly analyse the issues. Indeed, the donors now emphasise policy reform in their efforts to enhance rural development.

Three candidates are registered every year (Table 1) supported by the Joint UNICEF/IFPRI[1] Food Security Programme in Malawi, through a project entitled *Food Security, Agricultural and Nutrition Policy Research and Institutional Building at Bunda College of Agriculture*

1. International Food Policy Research Institute (hereafter called the UNICEF/IFPRI Project), which started in October 1992. The World Bank will be supporting an extra two candidates from the Ministry of Agriculture beginning 1994/95 academic session. The candidates become part of the research teams conducting food, agricultural and nutrition policy research at Bunda College and work towards their thesis which contribute to the overall research programme. All candidates registered so far are Malawi nationals, and only two are females.

Only one candidate has so far graduated from the programme, another candidate is expected to graduate this session. Only the part-time candidates have taken longer than the four years, the period stipulated for the MSc degree on part-time basis. These part-time candidates are normally in employment elsewhere and supervision sometimes becomes difficult. For this reason, it is difficult to assess the performance of the programme at the moment.

Contact Hours

The full-time MSc in Agricultural Economics Programme is a two - year (24 months) Programme having two components; formal courses and research. The course work includes a total of 14 courses and seminar presentations covering a total of 620 contact hours (450 hours of lectures and 170 hours of practicals/tutorials) (Table 2)(Bunda College, 1992a).

Table 2: Contact hours for MSc Agricultural Economics Programme

Course	Course number	Contact Hours		
		Total	Lectures	Practicals
Mathematics for Economists	RD 601	40	30	10
Statistics for Economists	RD 602	40	30	10
Microeconomic Theory	RD 603	80	60	20
Macroeconomic Theory	RD 604	40	30	10
Farm Management	RD 605	40	30	10
Agricultural Production Econ.	RD 606	40	30	10
Agricultural Marketing	RD 607	40	30	10
Agricultural Price Analysis	RD 608	40	30	10
Theories of Economic Growth and Development	RD 609	40	30	10
Agricultural Development and Development Planning	RD 610	40	30	10
Econometrics	RD 611	40	30	10
Research Methods for Social Sciences.				
Food and Agricultural Policy	RD 612	40	30	10
Environmental and Natural Resource Economics	RD 613	40	30	10
Students' Seminars	RD 614	40	30	10
		20	-	20
GRAND TOTAL		620	450	170

Course Sequence

The programme is divided into six terms. Terms 1 - 4 are devoted to teaching whereas Terms 5 and 6 are devoted to students' research, i.e., conducting research, data analysis and write-up, and presentation of thesis/dissertation. Below are the periods for the terms:

Term 1 : October - December
Term 2 : January - March
Term 3 : April - June
Term 4 : October - December (new academic year)
Term 5 : January - March
Term 6 : April - June

Table 3 indicates the courses taught in the various terms. Courses taught in Term 1 are prerequisites to the courses taught in subsequent terms. Students are required to prepare their research proposals at the end of Term 3 (July - September) when the rest of the students are on long (summer) vacation.

Table 3: Course Sequence for MSc Agricultural Economics Programme

Term 1 (October-December)	Term 2 (January-March)	Term 3 (April-June)	Term 4 (October-December)	Term 5&6 (January - June)
Mathematics for Economists RD 601	Agricultural Marketing RD 607	Agricultural Price Analysis RD 608	Food and Agricultural Policy RD 613	Research
Statistics for Economists RD 602	Econometrics RD 611	Research Methods for Social Sciences RD 612	Students' Seminars	Research
Micro economic Theory RD 603	Micro economic Theory RD 603	Macro economic Theory RD 604	Environmental and Natural Resource Economics RD 614	Research
Farm Management RD 605	Production Economics RD 606	Theories of Economic Growth and Development RD 609	Agricultural Development and Development Planning RD 610	Research

In addition to the formally taught courses, other special topics in agricultural economics are offered on an informal, self-help basis. These topics are: policy analysis matrices and their applications; introduction to social accounting matrices; food security and nutrition policy analysis; environmental and natural resources policy analysis; analysis of impact of market liberalisation; project preparation and management; monitoring and evaluation of development projects; economic analysis of agricultural biotechnology; dynamic programming in agriculture; agricultural household models; food security and nutrition monitoring; analysis of poverty, drought and famines; externalities in agriculture; economics of irrigation; aquaculture economics; economics of agricultural research; expert systems in agriculture; analysis of market integration and segmentation; sustainability in agricultural development; agroforestry economics; optimal control and calculus of variation; mathematical bioeconomics - applications to Malawi fisheries; structural adjustment and stabilisation in Malawi; forecasting with Box-Jenkins models; analysis of food subsidies; economics of pest and disease control; economic analysis of technology adoption; stochastic dominance analysis and applications to agriculture; and economics of risk and uncertainty (Bunda College, 1992).

Academic Staff Establishment

Postgraduate training in Agricultural Economics in the University of Malawi is mounted by the Rural Development Department. This is a multi-disciplinary department divided into three sections; Agricultural Economics (AE), Extension and Rural Sociology (ERS), and Language/Communication (LC) Sections. The Department's current academic staff establishment is 13, more than half of these are in the AE Section which is mainly responsible for mounting the MSc Programme (Table 4).

Table 4: Academic staff establishment for Rural Development Department, 1993/94 academic year

Section	Establishment	Posts filled		Posts vacant
		Local	Expatriate	
AE	7	4[a]	1	2
ERS	3	3[b]	-	-
LC	3	2	1	-
Total	13	9	2	2

a. One staff member is seconded to a project, and one member is away on study leave.
b. One staff member is away on secondment.

Although only two posts are vacant in the AE Section, only three staff members are fully available to the department for teaching. The section gets assistance in teaching the MSc courses from staff members in projects closely linked to Rural Development Department and from the Agricultural Engineering Department, so that the total number of staff actually teaching the MSc courses is six. The number of staff teaching the courses is likely to double by the beginning of next session as the department is in the process of recruiting three new staff members, one staff member will be returning from training, and two new project staff are

expected to arrive. Table 5 shows the current staff distribution by rank, all staff members are male.

Table 5: Distribution of staff by rank and section

Section	Associate Professor	Senior Lecturer	Lecturer	Vacant posts	Total
AE	2[a]	-	3	2[b]	7
ERS	1[c]	-	2	-	3
LC	-	1	2	-	3
Total	3	1	7	2	13

a. One Associate Professor is on secondment to a project.
b. These are newly created posts.
c. Away on secondment.

Table 6 shows that the department is deficient in most of the areas, particularly in econometrics. Expertise in food, agricultural and nutrition policy and in environmental and natural resource economics have been acquired by existing staff members through short courses/training workshops. Ideally each area should have two staff members.

Table 6: Distribution of AE staff by professional emphasis[a]

Area	Associate Professor	Lecturer	Total
Agribusiness Management	1	1	2
Agricultural Marketing	-	2	2
Agric. Production Economics	1	-	1
Agricultural Policy[b]	1	-	1
Development Economics	-	1	1
Econometrics	-	-	-
Environ. & Natural Resource Economics	1	-	1

a. Some staff have emphasised in more than one area.
b. Including food and nutrition policy.

The attrition rate is low. Only one staff member in the AE Section did not return after completing his PhD studies. Another AE staff has just been seconded to one of the projects at Bunda College, but still assists with the teaching of some courses.

Management of the Programme

The Head of the AE Section is responsible for managing the MSc programme in close liaison with other AE staff. The Head of Section is directly responsible to the Head of Rural Development Department, who is in turn directly responsible to the Dean of the Faculty of

Agriculture. The Dean reports to the Principal, who is the head of the institution, and the Principal reports to the Vice Chancellor who in turn reports to the Chancellor. At both college and university level, there are various committees, e.g., the Postgraduate Committee, to facilitate the management of the various programmes.

It is a University's regulation that an External Examiner is appointed for its programmes, be it at undergraduate or postgraduate level. At the MSc level, the External Examiner's role has been limited to assessing the candidates' theses, and this has so far been done by post for the MSc Agricultural Economics Programme. The first External Examiner came from the University of Nairobi, who has since finished his term, and the next one will come from the University of Swaziland. Apart from the External Examiner, an Internal Examiner and Internal Assessor are also appointed to examine the candidate's thesis.

The use of External Examiners is very important as it helps the candidate to come up with a better final product, apart from maintaining standards at the international level. This is system that we have found useful so far, and should continue.

Sponsorship Sources

As noted above, donors who have so far sponsored candidates into the MSc Agricultural Economics Programme are the Rockefeller Foundation, ICLARM, UNICEF and the World Bank. Government involvement has been minimal in that the World Bank scholarships will be for the government officers. One of the main problems for not continuously getting full-time candidates on the programme in the early periods was lack of scholarships. We are now able to offer the programme to full-time candidates continuously the past two years because of the UNICEF/IFPRI Project which supports three candidates every year.

In the past, emphasis was on overseas training (mainly in United States and United Kingdom) at the masters level, including MSc Agricultural Economics. However, opportunities for overseas masters training are diminishing due to donors' reluctance to support this type of training. This has increased the demand for local MSc training in Agricultural Economics and donors are likely to increase their support for the training. For example, the World Bank is now willing to support two MSc Agricultural Economics candidates every year beginning 1994/95 session; and Rockefeller Foundation has always been keen to support candidates at masters level. The chances of getting external candidates are also high as the programme becomes more established and is advertised in other countries, e.g., an application for admission in the 1994/95 session from a Zimbabwean has been received. The demand for the programme is high. There are many applications for admission, but we have been taking only three candidates due to lack of scholarships.

It is our belief that our graduates will be well-suited to the needs of the prospective employers, which are the civil service such as the Ministry of Agriculture and the Department of Economic Planning and Development; parastatals like the Agricultural Development and Marketing Corporation (ADMARC) and the Malawi Dairy Industries (MDI); and private organisations such Lever Brothers and estates. Input from main government ministries, parastatals, private organisations and donors was solicited when designing the curriculum and

syllabi for the programme. The emphasis on policy analysis is appropriate as Malawi faces complex agricultural policy issues and lacks expertise to properly analyse them.

The Library

The College has a library but with limited space. The sitting capacity is 90 but there are about 500 students and 50 staff members. The library contains most of the important texts required for the MSc programme which are acquired through the UNICEF/IFPRI project. Two copies of all important text books for the different courses are ordered for the library through UNICEF, and one text book is ordered for each student. The library also has a good collection of Malawiana and important journals for the programme.

The department has acquired some computers through the UNICEF/IFPRI Project, but are not adequate as they are used by both undergraduate and postgraduate students as well as staff members. There is one photocopier and a binder.

Exchange Programmes

The Department is a member of the Network and Centre for Agricultural Marketing Training in Eastern and Southern Africa covering Kenya, Malawi, Tanzania, Zambia and Zimbabwe. Information is exchanged through workshops, short courses and a newsletter.

Through a link relationship with the University College of Wales in Aberystwyth, staff exchange visits have taken place and joint research proposals are being developed, which will directly benefit the MSc Agricultural Economics Programme.

LINKAGES WITH POLICY-RELATED PROJECTS

Currently, there are three projects related to policy going on at Bunda College, which are directly linked to the Rural Development Department, and hence, to the MSc Agricultural Economics Programme. These projects are briefly discussed below:

a) **Food Security, Agricultural and Nutrition Policy Research and Institutional Building Project** - started in October 1992, supported by the joint UNICEF/IFPRI Food Security Programme. The major focus of the programme is to strengthen Bunda College as a postgraduate institution with adequate teaching, research and training capacity. The project has three main components; strengthening policy research, staff training and graduate training in agricultural economics (Bunda College, 1992b). IFPRI staff is directly involved in teaching the MSc courses and supervising students' theses. The project has also supported students' research and local staff members in the Rural Development Department to attend training courses. The department has also acquired equipment (computers, photocopier and binder) which have proved very essential for teaching and research. IFPRI is also taking part in the Agricultural Policy Analysis Training Subcomponent of the World Bank supported Agricultural Services Project described below.

b) **Agricultural Policy Research Unit (APRU)** - recently established with the support of USAID. Among other things, the Unit is expected: (a) to improve co-ordination of agricultural policy research at Bunda College and elsewhere in Malawi; (b) to enhance the leadership role of Bunda faculty by focusing attention on agricultural policy formulation in Malawi; and (c) to provide opportunities for formally linking policy-oriented agricultural and development activities at Bunda College with government, private and academic institutions in Malawi (Bunda College, 1993a) . The Unit, headed by a Malawi Programme Manager, will be working with a consortium of three Universities in the United States; Universities of Lincoln (Lead), Minessota and Florida. The Unit staff are expected to teach some of the MSc courses (see Table 5). Organised and planned well, the policy research activities of the Rural Development Department could be linked to the Unit.

c) **Agricultural Policy Analysis Training**. This is a subcomponent of the Ministry of Agriculture's Agricultural Services Project, supported by the World Bank. The Rural Development Department will be mounting short courses in food security, agricultural and nutrition policy analysis, initially for economists dealing with policy issues particularly from the Ministry of Agriculture. It is envisaged the training will later be opened to participants from the eastern and southern region. Local and international technical assistants will be responsible for mounting the courses and leadership of a local Training Programme Manager.

Six modules will be mounted: Project Preparation and Management; Monitoring and Evaluation of Development Projects; Environmental and Natural Resources Policy Analysis; Food Security and Nutrition Policy Analysis; Analysis of Impact of Market Liberalisation in Malawi; and Quantitative Methods in Policy Analysis (Bunda College, 1993b).

Through the subcomponent, two staff members from the Ministry of Agriculture will be registered into the MSc Agricultural Economics Programme every year; a computer training room to accommodate 20 computers, two offices and a 30-unit hostel for participants will be constructed.

CONCLUDING REMARKS

The MSc Agricultural Economics Programme at Bunda College is relevant and should be strengthened by addressing the major problems discussed below. The demand for well trained agricultural economists is high

Lack of Sponsorship

The MSc programme could not get full-time candidates before the UNICEF/IFPRI Project started because of lack of scholarships for students. This hindered the development of the programme and staff's capacity to implement it. There is need for students' sponsorship by encouraging donors, ministries, parastatals and private organisations to use local programmes. Without the sponsorship, the MSc programme cannot be sustainable (the programme costs about US$ 5,900/student/year).

Heavy Staff Workload

Introduction of the MSc programme has resulted in increased workload for the Agricultural Economics Section staff since the same staff members are responsible for the undergraduate courses. Efforts to get the staff establishment increased have not been very successful as the University's budgeting system does not cater for postgraduate training. This policy must be revised if postgraduate programmes are to be sustainable. The University's budget should cater for postgraduate programmes so that additional posts can be created in departments mounting MSc programmes.

Lack of Student Accommodation

Lack of student accommodation has also been one of the major problems in managing the MSc programme. Since the early 1980s, there has been no physical infrastructural development at Bunda College, and yet the programmes and student numbers have expanded. This has resulted in serious student accommodation problems so that the new intake always reports late, even up to eight weeks late. The remoteness of the College's location makes it difficult to rent accommodation outside the campus. A hostel for all MSc students is being constructed using the tuition fees, and chances are that another hostel will be constructed and the library expanded with the support from USAID.

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Table 1: Number of MSc Agricultural Economics candidates by programme type and academic year[a]

Programme type	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93	1993/94
Full-time	1	1	-	-	-	3	6
Part-time	-	-	2	2	3	3	3
Total	1	1	2	2	3	6	9

a. Academic year normally starts in September and ends in July although teaching starts normally starts in October and ends in June.

Table 2: Contact hours for MSc Agricultural Economics Programme

Course	Course number	Contact Hours		
		Total	Lectures	Practicals
Mathematics for Economists	RD 601	40	30	10
Statistics for Economists	RD 602	40	30	10
Microeconomic Theory	RD 603	80	60	20
Macroeconomic Theory	RD 604	40	30	10
Farm Management	RD 605	40	30	10
Agricultural Production Econ.	RD 606	40	30	10
Agricultural Marketing	RD 607	40	30	10
Agricultural Price Analysis	RD 608	40	30	10
Theories of Economic Growth and Development	RD 609	40	30	10
Agricultural Development and Development Planning	RD 610	40	30	10
Econometrics	RD 611	40	30	10
Research Methods for Social Sciences.	RD 612	40	30	10
Food and Agricultural Policy	RD 613	40	30	10
Environmental and Natural Resource Economics	RD 614	40	30	10
Students' Seminars		20	-	20
GRAND TOTAL		620	450	170

SESSION 6: DISCUSSION OF THE EASTERN AFRICA ASSOCIATION OF AGRICULTURAL ECONOMISTS (EAAAE) MATTERS.

This session was chaired by Prof. C. Ackello-Ogutu with A.G.O Okech being the rapporteur. Dr. Nguyo gave a brief background of the association. The EAAAE was launched in 1967 with offices at the then Egerton College at Njoro.

The objects of the association were to promote the study and teaching of agricultural economics, publish a regular EAAAE journal from 1968, conduct dialogue with policy makers and build strong links with the International Association of Agricultural Economists. The association held annual general meeting at which deliberation concerning the profession were discussed and elections held.

By 1977, the EAAAE could not continue its operations due to political and socioeconomic problems experienced in the region. The meetings could not produce good audited accounts. Many of the officials of the association went overseas for further studies, causing discontinuity in submitting reports and returns. The association problems were compounded by poor communication with the Department of Rural Economy, Makerere University, where the secretariat was then based due to the political problems in Uganda.

Discussion centred on the need to form a viable regional association. The benefits of such a professional association in the region would include:

- inter-departmental meetings for furthering academicians participation in research and professional meetings
- providing opportunity to discuss issues affecting the regions and being able to influence policy formulation
- provide a useful forum for training younger professionals
- provide the opportunity for publishing locally
- provide a focal point for linking with other organisations in the world

The main challenges for any association were noted as being those of:

(i) Sustainability due to funding and mobility of senior staff likely to provide leadership

(ii) Commitment of potential members; for example being able to sustain a journal requires materials from members in the first place. If publishable materials are not forthcoming, the journal collapses

(iii) Communication problems rendering networking difficult.

After deliberations on the issues, the following resolutions were unanimously adopted:

i) A new association to be named the "Eastern and Southern Africa Association of Agricultural Economists" be formed to replace the former Eastern Africa Association of Agricultural Economists.

ii) The organizing committee of the symposium to form part of the Interim committee of the new association. The organizing committee included Prof. C. Ackello-Ogutu - Convenor (Chairman), Dr. W. Nguyo - Policy Analysis Matrix - Egerton, Dr. A. Mukhebi - ILRI, Dr. R. Hassan - CIMMYT, Dr. W. Oluoch-Kosura - UON. Dr. S. Mbogoh - UON and Prof. Rop - Egerton Univeristy were coopted into the interim committee.

iii) Recommended that country representatives form part of the interim committee of the New Association. The country representatives were nominated as follows:

Country	**Representative**
Sudan	Dr. K. Hassan
Ethiopia	Prof. A. Tiruneh
Eritrea	*
Kenya	Dr. L. Kimenye
Tanzania	Prof. M. Mlambiti
Zimbabwe	Dr. G. Mudinu
Uganda	Mrs. T. Hyuha
Malawi	Dr. J. Mangisoni
Zambia	Dr. F. Mwape
Angola	**
Mozambique	**
Namibia	**

* Representative of Sudan to stand in before the country representative is established.

** Representative of Malawi to stand in before the country representative is established.

The interim committee was given terms of reference which included the following:

i) Review the old constitution to reflect new changes.

ii) Survey sources of funding especially locally for sustainability.

iii) To explore ways and means of linking with other similar Associations in Africa.

iv) To consider possibility of reviving the journal and review the status of the old journal (East African Journal of Rural Development).

v) Explore possibility of networking.

vi) Consider the publication of the symposium proceedings as a special issue of the journal.

vii) To contact agricultural economists not only in Universities but in other public and private sectors, including non-governmental organisations.

viii) To provide interim report of its activities in Harare in August, 1994 during which time other association matters would be discussed and resolved.

ix) To organise a conference preferably within 12 months but otherwise at a convenient time to formalize the new association.

The participants were very enthusiastic about the new association and promised to give the body all the necessary support to make it strong. In turn the interim committee pledged to do its best to establish a viable professional Association of Agricultural Economists in the Eastern and Southern Africa Region.

LIST OF SYMPOSIUM PARTICIPANTS

NAME	COUNTRY
Ethiopia	
D. Aredo	
H. Beyene	
W.M. Mwangi	
A. Tiruneh	
L. Dadi	
S. Ehui	
P.E. Pallangyo	
Uganda	
R. Hyuha	
E. Balirwa	
D.S. Ngambeki	
Zimbabwe	
G.D. Mudimu	
Kenya	
M. Odhiambo	
H.O. Nyangito	
O.L.E. Mbatia	
W. Oluoch-Kosura	
W.Nguyo	
K. Gitu	
J.O. Ndeda	
Arwings-Kodhek	
M. Mukumbu	
S. Mbogoh	
L. Kimenye	
D. Chanyalew	
C. Short	
C. Ackello-Ogutu	
R. Nyikal	
H.K. Maritim	
D. Chege	
J. Lugogo	
A. Okech	
J. Nyoro	
A.W. Mukhebi	
R. Hassan	

I. Elbadawi
L.O. Mosi
G.M. Lawrence
S.M. Karuga
M. Waithaka
O. Okello
P.M. Lewa
R.A Emorgor
D.M. Nyameino
I.A. Amadon
L. Chris

Malawi

Suresh Babu
J. Mangisoni
M.B.K. Mwale
R.S. Mzomde

Tanzania

M.E. Mlambiti
R.V. Kurwijila
N. Mdoe
E.R. Mbiha
S.L. Ishuza

Zambia
O. Mulenga
F. Mwape

Sudan

K. Hassan

The symposium hosted by the Department of Agricultural Economics (University of Nairobi) and the Nairobi Cluster Socio-economics Group in May 18-20, 1994, helped to bolster researchers' emotional resolve and professional commitment to active participation in the on-going development efforts aimed at eradication of poverty in eastern and southern Africa. The Eastern and Southern Africa Association of Agricultural Economists (ESAAAE), the inauguration of which was enthusiastically and unanimously endorsed by the symposium delegates, will now act as a powerful forum for debating traditional and emerging policy matters. Formation of national associations affiliated to ESAAAE will be encouraged and vigorously supported in order to create strong grass-roots level communication among professional researchers, policy makers and other stake holders.

The papers in this volume offer a lively debate on a wide range of issues relating to sustainability of agricultural production; agricultural development and trade; food security; agricultural policy; agricultural institutions; and human capacity building. The authors may not offer permanent solutions to all the daunting development problems in the region, but we strongly feel that their efforts signify the realization of the need to have a unified and coherent front for strengthening sectoral and cross-border linkages which contribute positively towards regional food security. We highly recommend these proceedings for students of agriculture, national and international researchers, donor agencies and policy makers.

Symposium Organizing Committee

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